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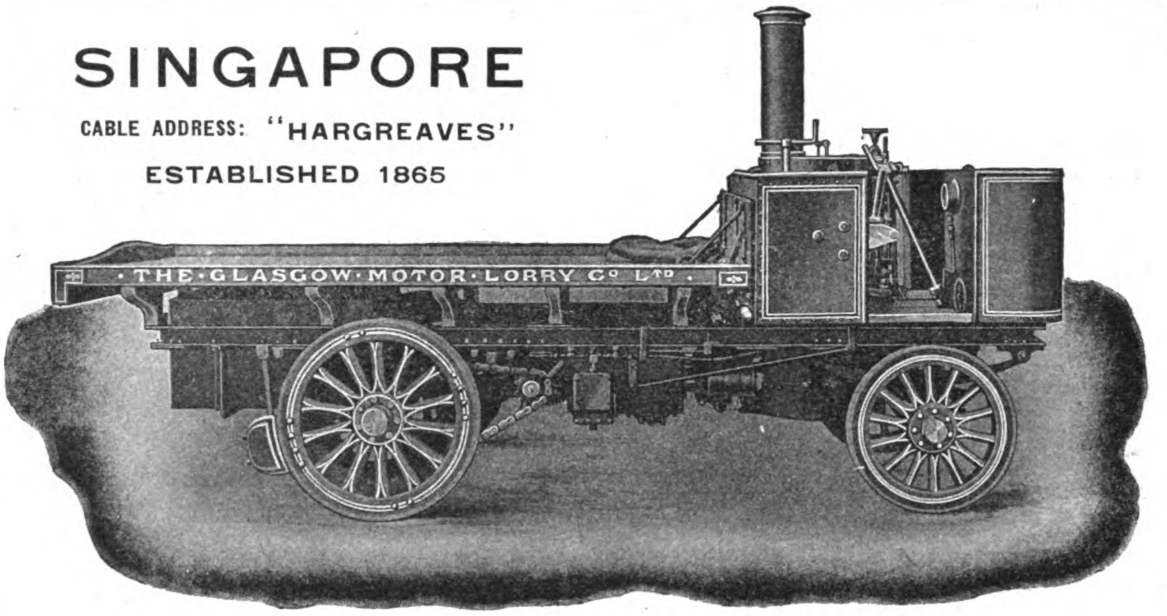

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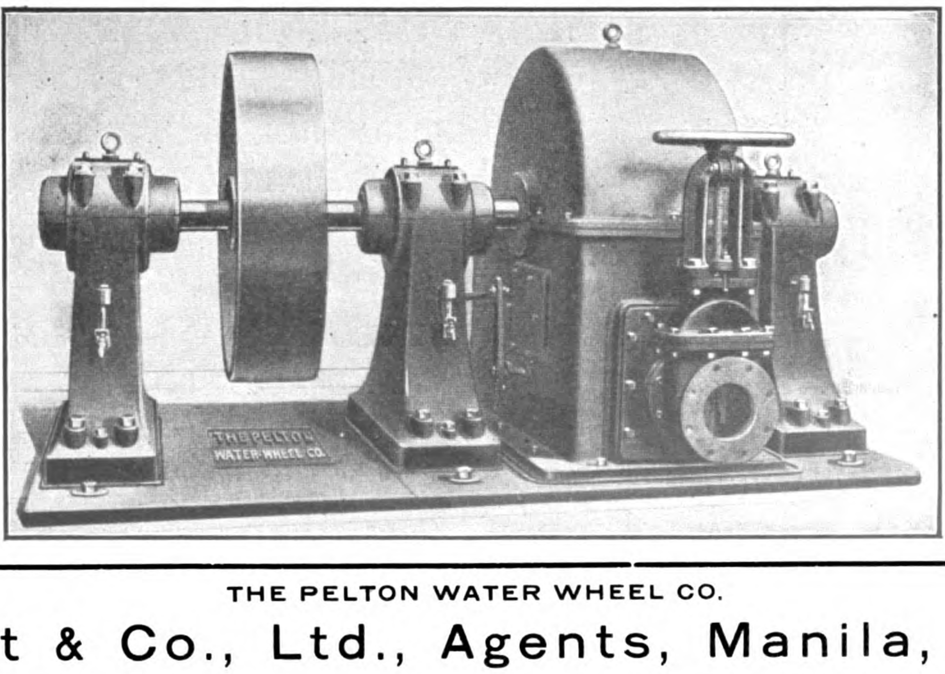

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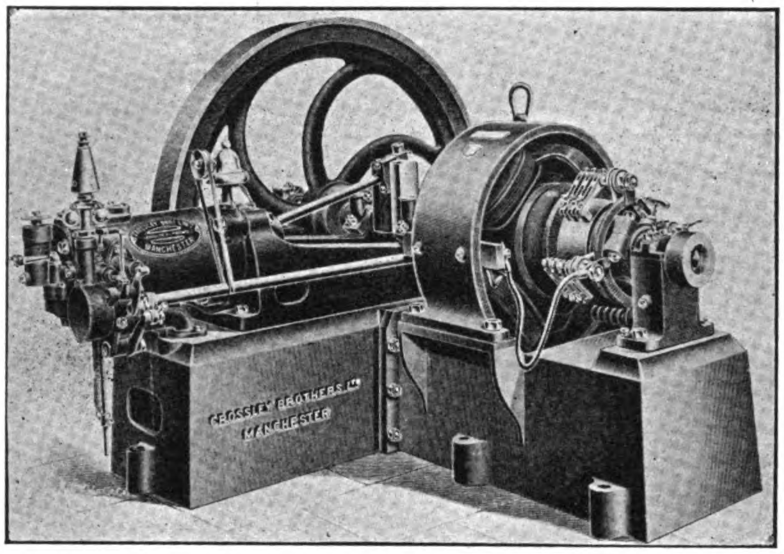

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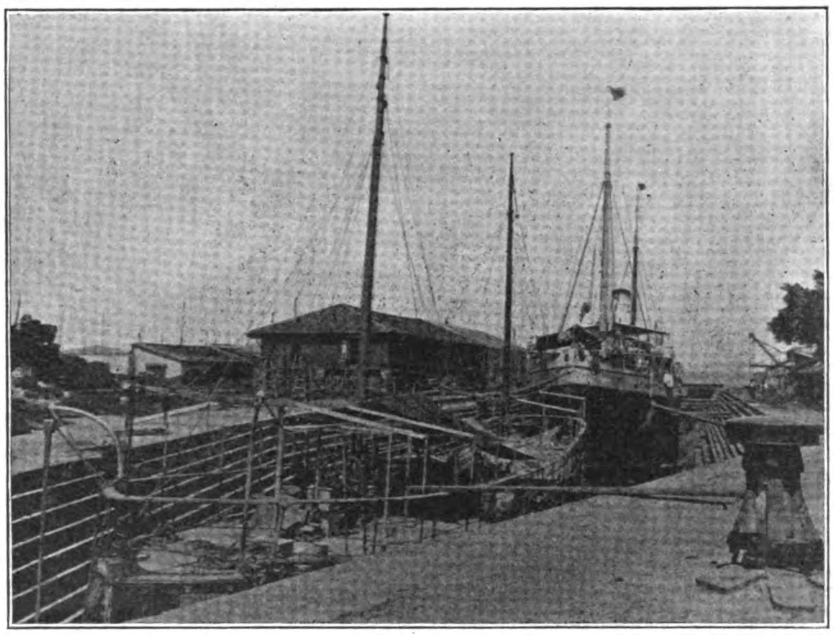

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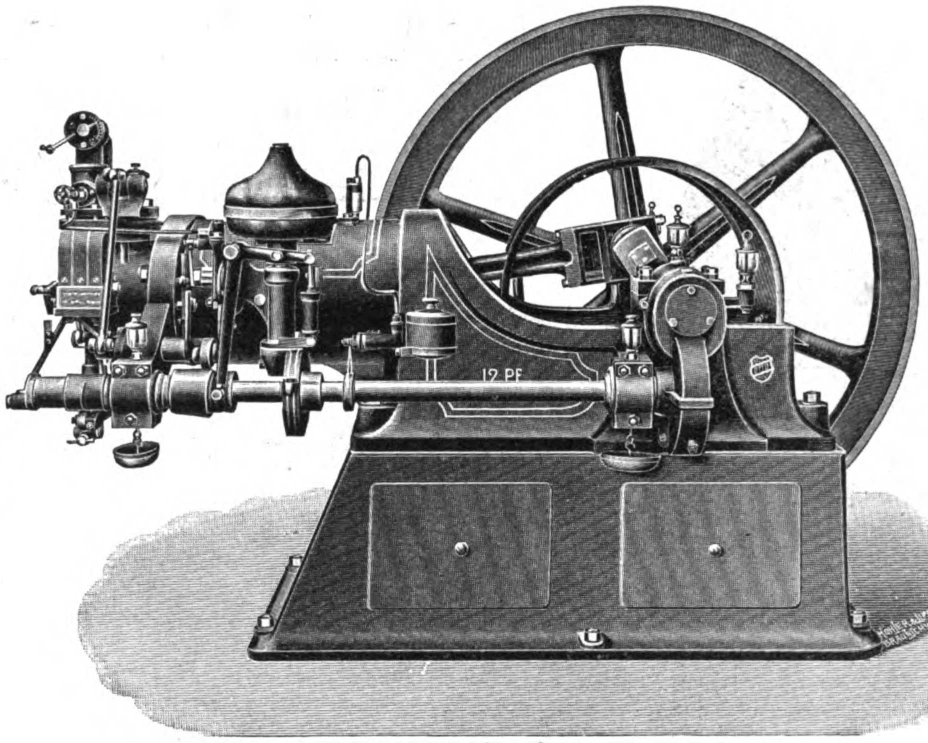

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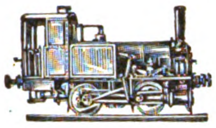

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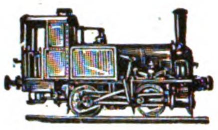

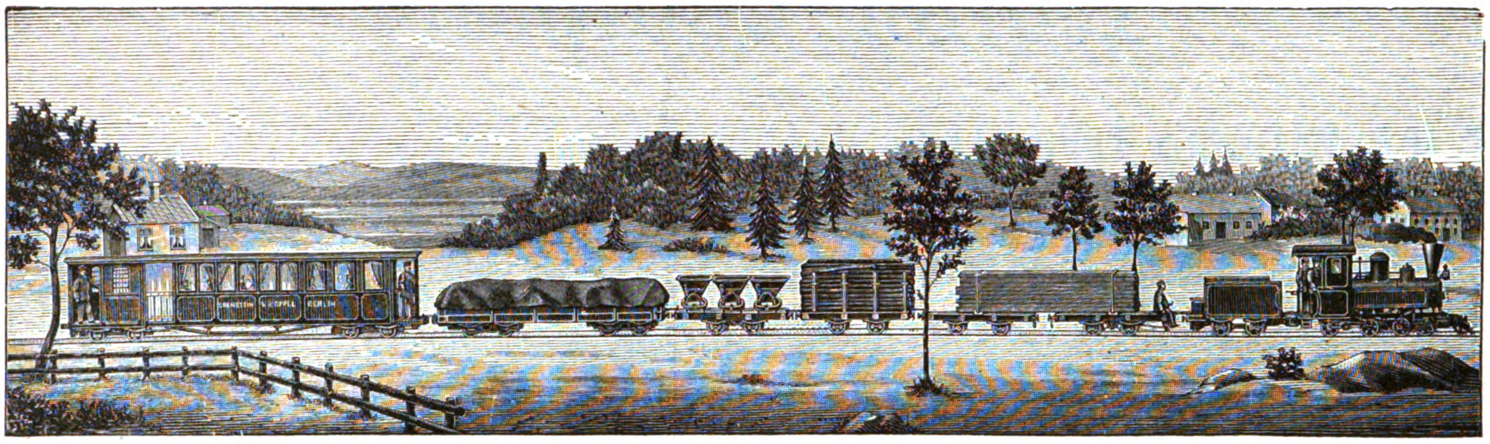

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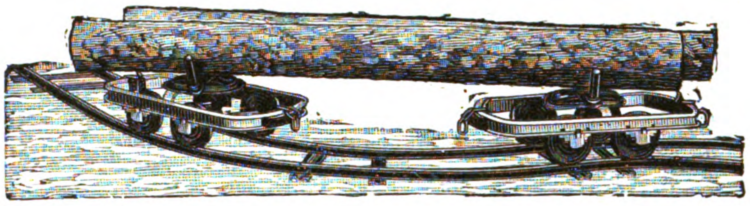

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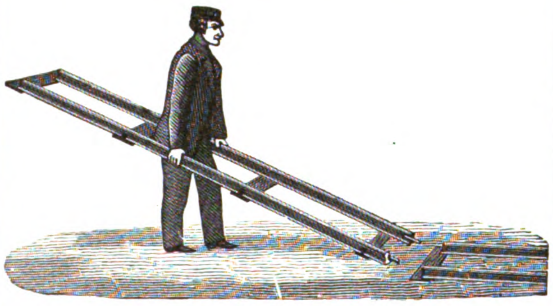

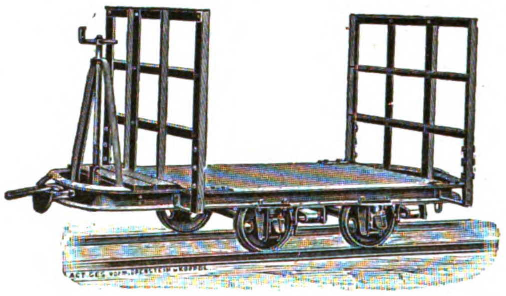

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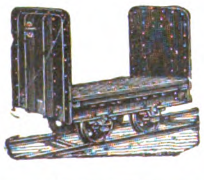

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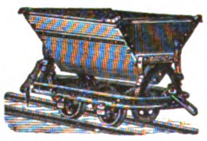

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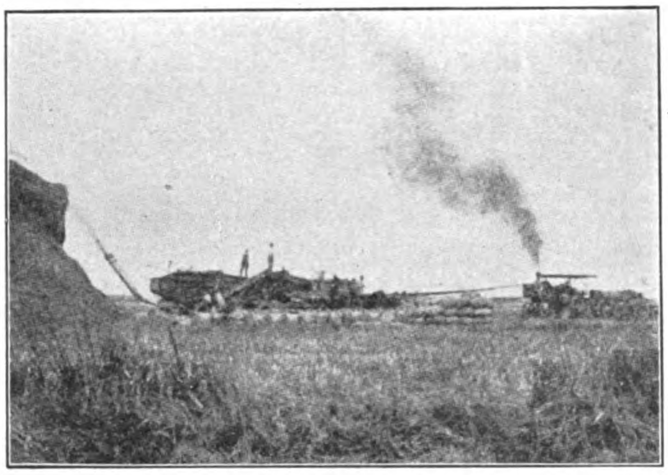

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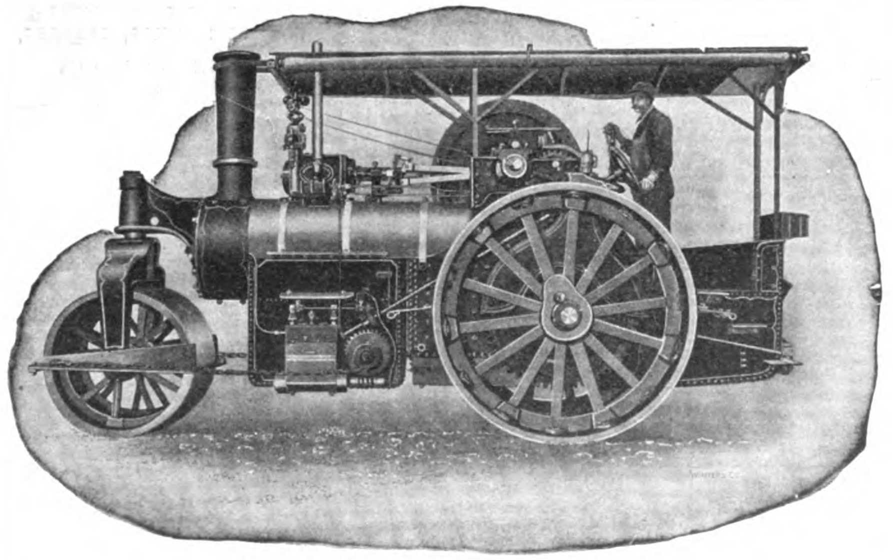

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THE FAR EASTERN REVIEW

COMMERCE ◉ ENGINEERING ◉ FINANCE

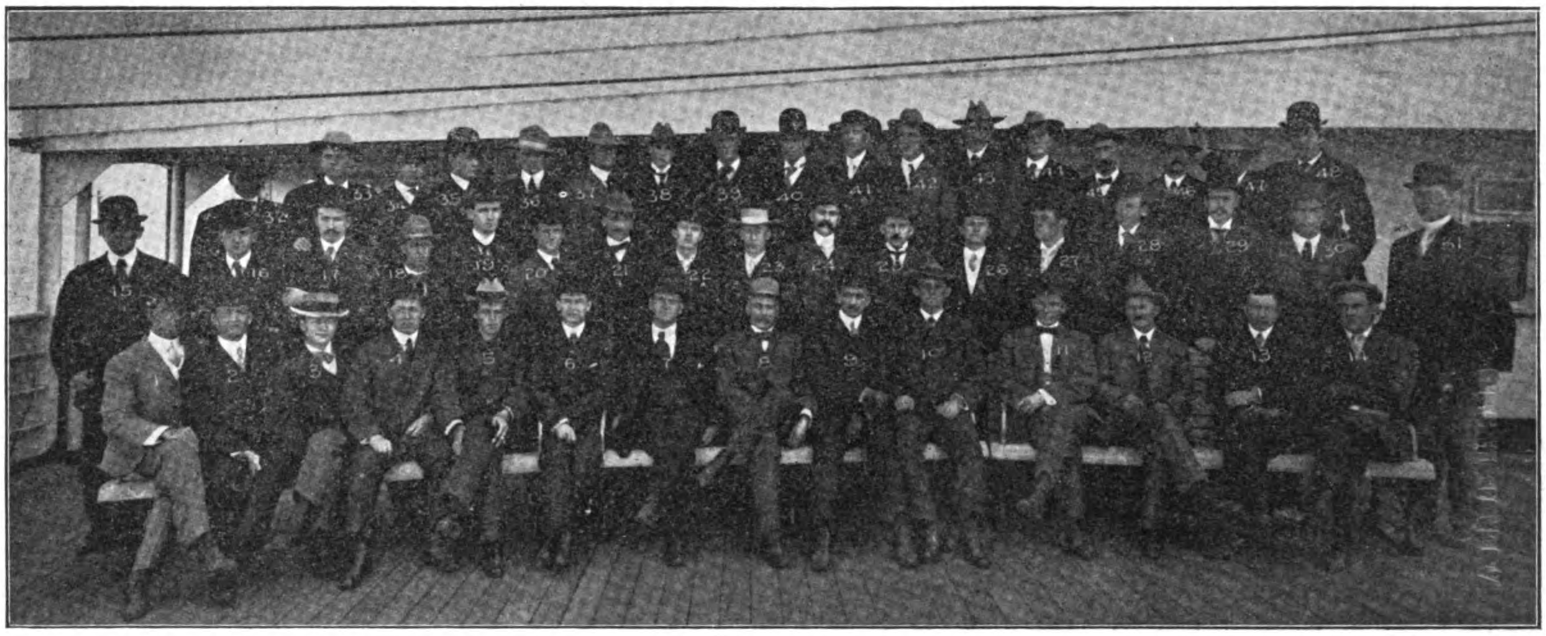
VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, JUNE, 1906. No. I.

ENGINEERS BEGIN THE SURVEY OF RAILROAD ROUTES IN PANAY, CEBU AND NEGROS, P. I.

The field corps of civil engineers sent out to the Philippines from the United States by Messrs. J. G. White & Co., Inc., of New York, London and Manila, which firm is under contract to construct railroads on the islands of Panay, Cebu and Negros for the Philippine Railway Company, under government concessionary grant, has established headquarters in Manila, and the locating parties have proceeded to the islands in the S. where their future operations will be carried on. The party was transhipped to the China Navigation Company's steamer *Tean* at Hongkong from the Great Northern Steamship Company's *Minnesota*, which brought it out from Seattle, arriving in Manila June 8th. The party includes field engineers, office engineers, cashier, clerk, stenographers, etc.; in fact, the nucleus of a complete organization, which, when finally completed, will comprise a total of about 50 men. This force will be followed later, as construction progress requires, by such supervisory forces and skilled labor as can not be supplied by the Filipinos, which will be the labor exclusively employed in the construction of these roads. The aggregate length of the railroads in these islands will approximate 400 ms. Eight thousand tons of steel, enough for 80 ms. of construction track; six locomotives for construction work, and the steel work for bridges were ordered by the chief engineer of construction before he left New York. The cost of the work so far provided for approximates $14,000,000 gold, and it is expected will require 4 yrs. to complete, owing to the conditions incident to the country, the principal obstacle to rapid work being the rainy season which greatly reduces the number of working days *per annum*. The unusual conditions connected with an undertaking of this nature in the Orient create for an engineer extremely interesting work, and each member of the party is in high spirits and much delighted with the prospect of the problems before him. It is announced by the chief engineer that he will purchase all the supplies that can possibly be furnished in the Philippines and the Orient. He expresses the hope that the Philippines will be able to furnish all the timber necessary, and prices and other conditions being equal he promises to give the local markets preference over outside markets. As far as possible the Filipinos will be given an opportunity to benefit by the construction from the very beginning both in the field and in the matter of furnishing available materials. This is a policy which the Philippine Railway Company insists upon and which will be complied with carefully where the exigencies of the construction warrant. It is intended to construct 100 ms. of line per year.

Heads of the Construction.—The construction of these railroads will finally be up to the Philippine Civil Commission, Mr. F. A. Molitor, M. Am. Soc. C. E., railway consulting engineer to the commission, and Mr. E. J. Beard, M. Am. Soc. C. E., of Kansas City, Mo., chief engineer of construction for the contracting firm. The latter gentleman has exclusive authority over the work, which includes the purchase of all materials. Both Messrs. Molitor and Beard are expert railroad engineers of many years' standing, and they come to the Philippines with records that bespeak for the work in hand prompt and efficient despatch. Mr. Beard has gathered about him a corps of engineers who have made railroad construction a study, many of them having worked in more difficult fields

(*Continued on page 5.*)



LOCATING ENGINEERS ON BOARD THE SS. "MINNESOTA," MAY 28TH.

KEY TO THE PICTURE:—(8) E. J. Beard, *Chief Engineer.*—(7) L. E. Bennett, *Right-of-Way Agent.*—(12) J. M. Robinson, (10) C. H. Farnham, (9) H. F. Howe, (6) C. J. Hogue, (11) F. D. Nash, (5) R. F. Ricker, *Chiefs of Parties.*—(4) B. B. Harris, *Office Engineer.*—(24) C. B. Sawyer, *Chief Clerk.*—(25) J. W. Krueger, *Cashier.*—(26) E. W. Brammert, *Private Secretary.*—(23) A. W. Hilton, *Chief Stenographer.*—(19) Walt. Dennis, (18) George L. Judson, *Office Draftsmen.*—(14) D. A. Calhoun, *Assistant Chief of Party.*—(2) C. J. Casseday, (1) R. L. Cooper, (3) T. W. Tiegen, (13) G. B. Kierulff, *Transitmen.*—(34) E. C. Alexander, (37) T. C. Edminster, (30) R. M. Elder, (28) H. C. Hill, (40) H. J. Kennard, *Levelmen.*—(41) Clay Anderson, (27) W. P. Miller, (45) J. C. Mulder, (29) F. S. Weston, *Topographers.*—(31) W. A. Reagan, (46) L. C. Stiles, (38) G. W. Todd, (21) J. P. Worthington, *Field Draftsmen.*—(48) F. A. Hatch, (35) H. B. Hull, (17) P. M. Poynter, *Assistant Topographers.*—(20) Herman Gard, (44) D. C. Hayne, (42) A. W. Hippe, (36) C. S. Kalbfell, (16) H. L. Pringle, *Rodmen.*—(33) L. H. Johnson, (47) E. W. Mitchell, (15) E. de Mitkeiwicz, (43) L. M. Newton, (39) A. L. Oliver, *Head Chainmen.*—(32) Charlie Bennett, (22) J. F. Lineham, *Tapemen.*

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THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.
PUBLISHER AND EDITOR

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A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in the Philippines and Far Eastern Countries

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MANILA, SHANGHAI AND YOKOHAMA, JUNE 1906

AMBASSADOR LUKE E. WRIGHT

The first 5 yrs. of American civil government in the Philippines will end with the dawn of Independence Day of this year. Some years hence, when the cooling influence of distance shall dissipate the mists of passion enveloping contemporaneous facts and they shall stand forth in their true proportions, the history of that period will be written. When the historian takes up his task, upon no pages will his pen dwell more extensively or approvingly than upon those recording the acts of the man who, for more than half that lustrum, stood at the helm of the insular administration—General Luke Edward Wright.

In commemoration of this half-decade and of the recent deserved elevation of our first Governor-General to the post of first American Ambassador Extraordinary and Plenipotentiary to the court of His Imperial Japanese Majesty at Tokyo, THE FAR EASTERN REVIEW, dedicated as it is in part to the industrial development and advance of the Philippine Islands, publishes, in the supplement to this number, a fine halftone cut of the new Ambassador who was, while he was with us, the decided champion of the cause we espouse.

To properly review the official career of our first Governor-General during the 5 yrs. he spent in the Islands, for more than 2 yrs. and 10 mos. of which he presided over governmental affairs, would be to recall a tempestuous formative period and evoke acts and scenes in which he was the central figure.

General Wright arrived in the Philippines as a member of the second or so-called "Taft Commission" on June 3d, 1900. Fifty-four years of age, with a vigor of mind and body acquired on the field of battle and in the arena of the forum, he brought to his new duties a ripeness of experience and judgment that boded well for the future. As a Confederate artilleryman he had fought through the Civil War. He served for 8 yrs. as the Attorney-General of his native state, Tennessee. He was a leading member of the Memphis Bar. The yellow fever scourge of 1878, which laid its desolating hand on the city of his birth, found him, in the very vortex of its attack, fighting its advance and ministering to its victims.

He gave a deep study to the Philippine problem, and, on reaching a conclusion, adhered to it during his stay in the Islands. He felt, as we do, that the archipelago was practically a virgin field; that the possibilities for development along commercial, industrial and agricultural lines were almost limitless. He was early convinced that what the Islands needed was commercial, industrial and agricultural regeneration and that this could not be effected without vouchsafing *equal opportunities for all*. This had been the experience of the United States, and he felt certain it was the only possible solution here. The Constitution under which he was born claimed this as a basic principle. He announced his platform in his first public speech in the Islands, delivered on the Luneta in Manila February 22d, 1901, and from it he never departed. It became the leading principle of his administration as Civil Governor and Governor-General.

Those among the natives who were opposed to him thought to see in his attitude a departure from Governor Taft's famous shibboleth, *The Philippines for the Filipinos*. Nothing more erroneous. In his inaugural address as Civil Governor, delivered in the Marble Hall, Ayuntamiento, February 1st, 1904, the distinguished Tennesseean said:—

> It seems to me desirable, therefore, at the earliest opportunity to emphasize the fact that the wise, humane and patriotic principles which controlled the administration of Governor Taft will not, at least consciously, be departed from by me.

And they never were.

Near the end of that luminous document, Governor Wright explained what he meant by his *Equal rights for all*. He said:—

> Every intelligent Filipino will realize that his people in their present stage of development are unable to stand alone, and that, in the very nature of things, they must lean upon some stronger arm. It is suicidal, therefore, to repel friendly advances made by those in authority, or to engage in a policy of destruction. * * * The coming of Americans to these Islands to build railroads and other works of public utility, to engage in agriculture, manufacturing or the mechanical arts, can only be of advantage to the Filipino people. There is room in these beautiful and fertile Islands for all. The door of equal opportunity should be thrown wide open for all alike—European, American and Filipino.

Fitting words, these, from a descendant of the hardy pioneer of the West who helped carve an empire out of Nature's raw material, and who welcomed every hand that added to the results sought, no matter whence it came.

That the Governor was right in his statement that Filipino can not *stand alone*, is borne out by the fact that barely a day passes that the native press does not deplore and attack the inertia of the people and, principally, the unwillingness of the monied Filipinos to furnish funds, individually or in combination, for the purpose of furthering great public or other works. A considerable portion of the population—if we may judge from the native press comments—is opposed to immigration of any kind. For some time it has been discussing academically and nurturing what it is pleased to term the *Filipino Soul*—whatever that is—which is apparently so weak and puny that it fears total destruction if modern ideas and methods are allowed to spring up in its bailiwick. This element is evidently opposed likewise to the contention of a modern Spanish philosopher who holds that there is no people that can preserve its nationality by isolating itself; that those who are always on the defensive perish in the end. It would be well if the native press would take to heart this same philosopher's words when he says:—

> At the outset I may be exasperated at him who comes to me with the intention of saving me, even against my will; but, as soon as I reflect, I must be grateful to him on seeing that he considers me as a brother. On the other hand, I can never conceive affection for the trader who leaves me as I am, and who respects even that which he thinks most pernicious in me, so long as he can exploit me and hold me as a customer.

This is the principle that inspired all of Governor Wright's actions while here. Faithful to his intention to do all that he could to benefit the material progress of the people of the Islands, which he believed, with all friends of the Filipinos, must be first secured before the great political end sought could be attained, he spared no pains in the Islands and in the United States to bring about legislation and awaken interest favorable to his purpose. He spent the whole of his two vacations in the United States knocking at the door of Congress for recognition of the rights of this people in matters financial and commercial.

In October, 1902, after having acted as Civil Governor for over 10 mos. during the illness and absence of Governor Taft, and having conducted affairs during the terrible cholera scourge of the spring of 1902, he visited the homeland for vacation. He, however, enjoyed but little leisure. During the entire LVIIth Congress, from December, 1902, to March, 1903, he gave his time and labor to securing legislation of the greatest importance to the welfare of the Filipino people and the business prosperity of the Islands. He was largely instrumental in securing the passage by Congress of three measures of great benefit to us. They were the Currency Bill, the Constabulary Bill and the $3,000,00 Agricultural Relief Bill. When he returned to Manila April 30th, 1903, he was most warmly and enthusiastically received by the people of Manila.

Just prior to the departure of Governor Taft to assume the office of Secretary of War, on December 22d, 1903, Governor Wright again took the reins of government in hand in the capacity of Acting Civil Governor. On February 1st, 1904, as we have stated, he was inaugurated Civil Governor.

In the closing months of this year occurred the ladron outbreak in the provinces of Cavite and Batangas. Montalon and Felizardo, with some five or six other bandit leaders, made assaults on Taal, Batangas, San Francisco de Malabon, Cavite, and other pueblos. Governor Wright had felt for several months that the conditions in the two provinces were reaching an unbearable stage, but wished to give the local authorities every opportunity to deal with the situation. When they clearly showed their inability to cope with it, and peaceful citizens clamored for protection in their persons and property, he felt that his duty to the people demanded prompt, firm and decisive action. As a soldier he knew that in such junctures an ounce of lead is worth a ton of argument. The peaceable citizens would have to suffer the inconvenience of a military campaign. His aim was to make their suffering as short as possible. The Philippine Commission authorized and Governor Wright proclaimed the suspension of the writ of *habeas corpus* in both these provinces on January 31st, 1905. By the employment of United States troops, Philippine Scouts and Philippine Constabulary, and rigid measures, the necessity of which he deplored as deeply as could any one, in a few months the atmosphere was cleared and the peaceably-inclined could engage again in their daily vocations unhampered. The suspended writ was restored on October 19th, 1905, although active operations had ceased some time before.

Some months previous, on February 6th, 1905, by *Section 8* of the "Cooper Bill," enacted into law and approved on that date, the designation of the Civil Governor was changed and General Wright became the first American Governor-General of the Islands. The Secretary of War, on the following day, cabled as follows:—

> WRIGHT, Manila.—I salute and congratulate the first American Governor-General of the Philippine Islands, and wish for him the same success which has attended his administration as Civil Governor. —(Signed) TAFT.

The Secretary's wish was echoed by all those who had the true interests of the Islands at heart. And who are they? Those who waste their time and those of their countrymen entoning dithyrambs and tropes to the *Filipino Soul*, while fields lie fallow and bare? Those who cleave the ambient with fustian shouts for immediate independence, when warehouses are empty and ships are rotting at anchor? Those who with folded arms and dreamy eyes look to Providence or the Government to reap a miracle of the Heaven-sent manna, while industries languish and the song of the sickle is hushed? Or are they those who, like our late Governor-General, bend every nerve and effort to bring about progress, prosperity and plenty through the fostering of every measure that tends to bring hither the Archimedean lever of capital to uplift from their present prostration the industrial, commercial and agricultural interests of the Islands?

Ambassador Wright, while a member of the Philippine Commission, Secretary of Commerce and Police, Civil Governor and Governor-General of these Islands, more than any other one man, devoted his time and attention to the furtherance and promotion of those interests which THE FAR EASTERN REVIEW covers and claims as its particular field. What he sought was better roads, better fields, better homes, better tools, better shops, better ships, and more and better harbors and other public works—the harbingers and champions of better times. In his endeavor to bring these about, he advocated everything that would make them possible, and deprecated everything that would retard their advent, such as political unrest, vain repining and *rainbow chasing*.

It has been said by some of the natives disaffected because of the Internal Revenue Law, that General Wright was responsible for its allegedly onerous provisions. Those who are in the best position to know affirm that nothing could be more erroneous. Champion as he was of the upbuilding of existing and the introduction of new industries, he it was who by his arguments and influence with his fellow members of the Philippine Commission succeeded in removing many a *sting* from the measure before it was enacted into law.

When the history of the legislation of these first 5 yrs. of civil régime is written, the name of Luke E. Wright will figure as the author of many excellent laws, all tending to improve the material condition of things in the Islands. Space forbids enumerating them.

Always modest, self-effacing, generous, kindly, truth-loving, he will be long remembered by those whose destinies were in his hands for many years. Although an orator of sound and persuasive periods, he was preeminently an advocate of action. In the homely phrase of our native land—so discomfiting to the voluble—he was the apostle of *Stop talking and go to work*.

THE FAR EASTERN REVIEW extends its congratulations to the new Ambassador and to the great American people he so worthily represents at the court of the Mikado, and wishes for him in his mission the success which his high character and purposes must achieve if allowed untrammeled play.

OUR SHIPBUILDING INDUSTRY

During about 14 mos., ended December 31st, 1905, shipowners in the Philippine Islands spent something like ₱450,000 ($225,000 gold), to foreign dock companies for ship repairs alone, probably every dollar of which might have gone to the local shipyards and marine repair concerns had it not been for the discriminating and insurmountable tariff wall which shuts in and paralyzes their industry.

In our May issue we published an editorial in which we pointed out the disadvantages under which the insular concerns are operating. Since then we have secured a partial list of the privately-owned vessels that have been sent abroad to be docked, overhauled and repaired during the period above mentioned for the sole reason that the local companies were unable to meet this China Coast competition. These vessels represent the expenditure of that ₱450,000, and are as follows:—SS. *Venus, Ban Tek, Butuan, Dos Hermanos, Montañas, Magallanes, Atlantas, Iruña, Juno, Fernandez Hermanos, Romulus, Legaspi,* and *Tayabas*, the schooner *Kodiak*, and the barkentine *Alta*. The spirit of loyalty to home enterprise prompted the shipowners first to offer the work to the local concerns, but in every case the China Coast shipbuilders stepped in with figures which meant the saving of thousands of pesos to the owners by sending the work abroad, and in business, as well as in life, the first law being self-preservation the owners were compelled to send their ships away. The local concerns appreciated the situation and could not complain against the principle involved.

It is impossible for us to get figures covering the repairs that have been made on the China Coast in army transports, the American warships in these waters, and the coast guard cutters of the civil government; yet it is safe to say that more than double ₱450,000 has gone to foreign ports when most of that vast sum might have remained in the Philippines had conditions been such that the insular companies could have met the competition on a fair basis.

Taking into consideration the present deplorable state of the industry in the Philippines, therefore, and knowing that something should be done immediately to resuscitate the business, we most earnestly urge the concerns interested to get together and devise some plan for relief. We believe the Philippine Commission would welcome a tangible proposition that would have for its object the restoration of the industry to prosperity. This would mean much to Manila, Iloilo and Cebu, because with all the plants running to their fullest capacity there would not only be plenty of labor for mechanics and other workmen but thousands upon thousands of pesos that are now being withdrawn from local circulation to meet the demands of the China Coast concerns would remain here, thus adding to the general stability of business. There are great possibilities here for shipbuilding and marine repair work under regulations that would insure fair competition, and it seems a pity that tariff laws ignorantly applied by the far-away congress at Washington, as they are in this case, should be the stumbling block to progress and prosperity in this line.

JAPAN, THE ENGLAND OF THE FAR EAST

Mr. Miller, American Consul-General at Yokohama, in a recent report to Washington, says:—

> The chrysalis of Japan's commercialism and industrial life has broken the cocoon of opportunity, and she is reaching out towards the consummation of another hope—leadership in the trade of the Far East. *** The Government is refunding its debt at less than 5 per cent, every industry needing help is specially aided and assisted by the Government, as an instance of which, all the match factories are merged under an imperial license, and paternalism is becoming the keynote of the empire's future progress. The Japanese chambers of commerce in convention call for consolidation of banking houses, an extended consular service, and floating museums to exploit Japan abroad.

Government ownership and direction of public utilities and manufacturing is not a new idea in Japan. Under the feudal system of old Japan it was exercised in the broadest possible sense. Now this is exactly what the government is doing today. It is working in a broader way, however. It does not exact direct tribute, as in the olden times, and the producers receive better returns for their labor. But none the less the government is exercising a supervision over all the industries it does not control and fostering in every way the development of new ones. This application of government concern in an industrial sense is what is making Japan industrially and commercially strong. As is well known the government controls today many of the important monopolies. A large percentage of railroads, the telegraph and telephone lines, the salt works, the tobacco monopoly, and the camphor production are directly under the control of the government. Following is a list of the factories conducted by the government:—Printing Bureau, which includes printing, type foundry and paper mill; mint; Tokyo arsenal; Osaka arsenal; Senjii woolen factory; canning factory; clothing stock; surveying and map drawing;Yokuska shipyard, dockyard, and arsenal; Kure shipyard, shipbuilding, ship engine, and arsenal; maizura shipyard, shipbuilding, ship engine, and arsenal; naval arsenal; Shimose powder works; Takeshiki dockyard; Ominato dockyard; steel works; telegraph and light-house stores, and railway works.

Thus we find in the case of contending business concerns the force and power of the government in recommending a combination of interests, to the end that all may live and the industry prosper from concentrated effort. This we find exemplified in the recent combination of the various match-making concerns. The government viewing the warring competitors, steps in and advises the formation of a trust. The business is put under the license system, and the government promises in consideration of the combination, the issuance of an imperial license, which virtually shuts off competition, and incidentally puts the industry directly under the control of the government.

As a further illustration of how closely the government guards the interest of the people in industrial matters, it might be well to cite the case of the *Use of Fertilizers* by the department of agriculture. This branch of the public service undertakes and does examine scientifically and from an economic standpoint, the value of the different fertilizers imported, and advises the farmers as to their relative value and utility. The importation of fertilizers is one of the most important items in Japan's commerce, and here again we see an illustration of the power of the government.

Throughout the empire there are banks known as *hypothec banks*. It is the business of these to advance money on growing crops or help financially in the development of some industry. These are similar banks to those which obtain in the United States, with this exception—the government is indirectly represented in the directorate of these banks and sees to it that they do not want for financial assistance in time of need. This evidences in another and more potent way the work of Japan in the development of her industries.

More important, however, than the hypothec banks is the great Industrial Bank of Japan. This bank was established in April, 1902, with a capital of $4,980,000. Besides doing a general banking business, this institution makes loans, takes up public loan bonds, local loan bonds, company debentures, etc. In order to enable it to obtain the necessary amount of capital, the bank is authorized to issue debentures to an amount of five times its paid-up capital (which is $1,245,000 gold). The first five yrs.' dividend of 5 per cent of its paid-up capital is guaranteed by the government. It is interesting to note, in this connection, the recent action of the board of directors of this bank in furtherance of the general plan of increasing the capital of the country for the purpose of commercial and industrial development. The general outline of the plan is to induce leading financiers abroad to have direct interest in the bank by becoming shareholders to the extent of $3,750,000 gold out of $8,750,000. The authorized capital of the bank, as stated above, is $4,980,000 gold, divided into shares of $50 each. It is intended to change these shares into $25 shares, making the total number of shares owned by the Japanese shareholders 200,000. Over this $3,750,000 gold capital, divided into 150,000 of $25 shares, is to be increased and to be owned by leading financiers abroad. By this arrangement the Industrial Bank hopes to become an international institution, which will be of general utility both to foreign investors and to various enterprises in Japan. It is understood that England subscribed to the full amount of the shares offered for foreign purchase, and that the capital realized from this sale, amounting to $3,750,000 gold, has been spread throughout the Empire in diversified industrial projects that give promise of large returns.

In line with her unusual activity on land is the determined effort to increase the efficiency of her merchant marine. Only the other day the newspapers heralded the fact that one of the subsidized lines—the Toyo Kisen Kaisha—

had made an effort to purchase the entire equipment of one of the American Pacific steamship lines. That the government is fostering this there can be no doubt. The influence of the government is felt in all lines of commerce and industry. Such paternalism exists that no one in business, pressed by the exigencies of the times, hesitates to call upon banks indirectly controlled by the government for assistance. In fact, the commerce of Japan to-day is almost entirely supervised by the government. What such an ownership or control forebodes in the struggle of nations for the commerce of their people only the future can determine.

Considering, for the nonce, the general subject of government ownership and supervision, one would think such a transaction would engender bitterness among the people. This, however, is not the case. The old system under the Shogunate is of too recent date to stir up much opposition, and, then, the people feel an absolute security in the integrity of the government and give to it all the earnest support and assistance they can render. The change has been gradual, and, more important than all, the people have prospered under it more than at any other time in their history. It is no wonder, then, that government ownership and direction is invited in many lines.

Against this government ownership of industries and paternalism, however, there is some opposition, which appears to be growing. This is instanced at the meeting held at Tokyo October 10th, last, at which all the chambers of commerce of Japan were represented. Among other important resolutions passed was one which set forth that government monopolies such as tobacco, salt, camphor, etc., are desirable neither as a government resource nor as bettering the industry. The salt monopoly first of all should be abolished as soon as some other resource is found and there should be no other government monopoly. What effect, if any, these resolutions will have upon the government is not known.

The development of the people generally and the consequences of increased trade has brought about substantial increases in the matter of wages, and the whole empire to-day is enjoying a prosperity in this line greater than it has ever known. But even with the material advances that have been noted during the past few years, the pay of the average workingman is but a small percentage of what their more fortunate American brothers receive. The simpler mode of living, the few necessities, and the relative cheapness of food stuffs and clothing are the principal factors in this equation. Following is a table giving the average daily wage (in United States currency):—

Occupation	1887	1897	1903
Carpenter	$0.11	$0.27	$0.30
Stonecutters	.12	.29	.34
Brick worker	....	.24	.26
Bricklayer	....	....	.37
Mat worker	.11	.19	.25
Cabinetmaker	.10	.19	.27
Wooden-shoe maker	....	.16	.21
Leather-shoe maker	....	.19	.27
Blacksmith	.15	.20	.26
Potter	.10	.45	.20
Shipbuilder	.12	.22	.31
Farm laborer (male)	.07	.15	.16
Farm laborer (female)	.04	.08	.10
Silk spinner (female)	.06	.12	.17
Day laborer	.08	.15	.20

Japan is attracting the attention of the world to her porcelain products. The industry is one of the oldest in the empire, having come from China centuries ago. But it has only been in recent years that Japan has exported this line of merchandise to any extent. The combination of oriental with occidental ideas has developed an article which finds a ready sale in the markets of the world. Many fine imitations of French creations are made and largely sought. Among other considerations, the introduction of foreign machinery in at least two of the large porcelain factories has been responsible for the growth of this industry. Most of the factories, however, employ the crudest means in the manufacture of porcelain, even molding by hand, and the percentage of damaged goods due to imperfect molding cuts quite a figure in the account. But sooner or later the principal factories must adopt up-to-date methods if they would keep pace with the more progressive manufacturers. The spirit of combinations in this line is pervading the Empire and many of the smaller producers are under the direct control of large concerns.

Japan with her limited territory and nearly 47,000,000 of people, requires much in the way of imports, and coincident with the development of the empire and the advancement of the people, will for many years require more and more in the shape of foreign-made articles. Foreign manufacturers will find in some lines that Japan will be able in a few years to make herself independent of foreign-made goods. This will doubtless be evident first in the manufacture of cotton yarn and fabrics, and the commercial world will first be convinced of Japan's commercial development in this line.

Few industries in Japan have shown a more substantial growth than the manufacture of cotton yarn and fabrics. Throughout the empire cotton mills are being erected, and late reports indicate material growth in all lines manufactured. To-day Japan is able not only to supply her own wants in a large measure, but is reaching out for the control of the cotton yarn and fabric market of China, which has long been one of our manufacturers' best customers for cotton goods. Japan is at present dependent upon the United States and India for her raw cotton. She has neither the domain nor the climate necessary to produce cotton in large quantities. But Japan's influence will be keenly felt in the sale of cotton yarn and fabrics. She is better qualified to supply the oriental demand for cotton goods than any other country. She knows and understands the wants of her people and those generally of the Far East, and is preparing to furnish them. This, added to her geographical position, will make her a dominant factor in the cotton trade of the Far East. In this connection it might be well to consider what Japan has been doing for herself. In 1902 the cotton fabrics imported in the shape of prints amounted to $1,301,016 gold; in 1903 this amount had been reduced to $987,688, while for the year 1904 they fell to $266,046. These figures indicate that Japan is already beginning to supply her own people with this class of merchandise. The imports of ginned cotton, on the other hand, have shown an increase. In 1903 they amounted to $34,103,362.50 gold, while for 1904 they increased to $35,733,422. Leaving out of consideration her home consumption, Japan exported to China in 1895 cotton yarn to the amount of $517,239 gold. Last year, notwithstanding the demands of the army for cotton goods, such as khaki clothing, blankets, shirtings, and socks, her exports of cotton yarn increased to $14,634,288 gold. In other words Japan has been supplying China with the material to make her cotton goods, and is now seeking to increase and develop this trade by producing a finished article which will meet the demands of the Chinese in quality and cheapness. Take the subject of cotton blankets as another illustration of the development of the cotton industry. In 1896, when Japan first began the exportation of this article, she sold $60,297 gold worth in the markets of China and Korea. In 1904, notwithstanding the demands of the army, which were enormous, the exportation of cotton blankets had risen in value to $1,779,449 gold. As another evidence of the satisfactory condition of the cotton industry in Japan, it might be pertinent to state that all the spinning mills are flourishing. Increased dividends to stockholders are the rules and many new mills are in course of construction. A recent report of the business done by the Settsu Spinning Company, of Osaka, shows the estimated net profits for the past 6 mos. to have been enormous, out of which a dividend of 20 per cent will be paid the stockholders. A recent newspaper article bearing upon this subject says:—"The continued prosperity of the yarn market has greatly improved the financial position of the Kibi Spinning Company, of Okayama, which has been in difficulties for some-time past. A few years ago the company borrowed $113,000 from the Yamagushi and Konoike banks, of Osaka. With this handicap the company's prospects were not very bright but the wave of prosperity for the spinning companies that has been experienced in the past year or two has enabled the company to repay $5,000 gold monthly to its creditors since June last. From February this was increased to $10,000 monthly, which will clear off the debt by August next. The company owed a large sum to certain foreign firms, which was compromised by being reduced two-thirds in amount, and the last installment of this reduced the debt and it has now been paid."

The most marked feature of the year 1905 in the industrial life of Japan is the vast number and amount of new loans that are being placed abroad. The government is redeeming its 6 per cent bonds, for which it received from 86¾ to 90, with 4 per cent bonds for which they receive 88. This is the measure of the improvement in the national credit of Japan since peace was declared. The improvement in industrial credit is equally marked, and many 9 per cent loans are now being redeemed with 6 per cent loans, and large amounts of new loans are added to promote other industries. Several large loans have lately been negotiated for opening and extending mines, making improvements and extensions, and construction of new lines of railways. These loans have been mostly on 20 yrs.' time at 4½ per cent interest and issuing price of 92. Many other industrial loans are being made at about 6 per cent for a great variety of manufacturing and industrial enterprises. This great reduction in the rate of interest from 9 per cent to 6 per cent and less is certain to lift the heavy load from many enterprises and give them a new impetus. The result of these great foreign loans at this much reduced rate of interest to banks, railways, and all forms of industries and commerce will be to provide much lower rates for many. The present bank rate of about 8½ per cent will either be lowered, which in itself will encourage business of every form, or the expansion will be so great in trade and commerce that this increased capital will be put into enterprises that will sustain this high rate. In either case a large increase in various forms of industry and business seems to be at hand for Japan. The vast amount of cheap labor and splendid industrial skill in the country, combined with this reduction in interest on borrowed capital, together with the broad field of exploitation and markets now assured to Japan throughout Korea, Manchuria and China, makes an excellent foundation for commercial and industrial expansion, upon which Japan will proceed to build her new national structure.

In manufacturing development Japan is making progress in production of iron, steel, electric-light appliances, wire, rails and cars, cotton goods, and in a great variety and diversity of lines. Linen is brought from Ireland and made into collars, cuffs, drawn and embroidered work, and then sent to Europe and the United States. The surprises in Japan's manufacturing development will come as much in diversity as in the general volume of business. Especially will it be marked in all lines that require delicate and artistic handiwork.

The Osaka Alkali Company is floating a foreign loan of $250,000 gold through Samuel & Co., one-half of the sum to take up the existing debentures, the other half to establish a new fertilizer factory. Messrs. Samuel & Co. will become sole agents in Hongkong and southward for the sale of the sulphuric acid produced by the alkali company. The government iron foundry at Edamitsu, near Moji, has been so much enlarged and improved that the authorities optimistically believe the foundry is in a position to supply all home demands, and rails at least need not again be imported from abroad. The foundry is about to begin manufacturing telegraph wire and railway carriage iron. Its present output is 70,000 tons *per annum*.

EQUIPMENT FOR PONIES IN THE FIELD WITH THE RAILROAD LOCATING PARTIES, MANUFACTURED BY MESSRS. PICKETT & ROBERTS, MANILA

ENGINEERS BEGIN THE SURVEY OF RAILROAD ROUTES IN PANAY, CEBU AND NEGROS, P. I.

(Continued from page 1.)

than that which will be encountered in Panay, Negros and Cebu. Others have had much valuable experience with railway construction in the Tropics of Central and South America, so that altogether the personnel of the party augurs much for the efficient consummation of the work in hand. Mr. Beard's principal assistants are Mr. L. E. Bennett, right-of-way agent; Mr. J. M. Robinson, late locating engineer of the Guayaquil and Quito Railway; Mr. H. F. Howe, late acting chief engineer of the Canton and Hankow Railway; Mr. C. H. Farnham, M. Am. Soc. C. E., late division engineer and superintendent of construction of the San Shui Division of the Canton and Hankow Railway; Mr. C. J. Hogue, M. Am. Soc. C. E., late engineer-in charge of maintenance and way of the Choctaw District of the Rock Island System; and Mr. F. D. Nash, late engineer-in-charge of 50 ms. of reconstruction of the Chicago, Burlington and Quincy Railroad in Iowa. Mr. Bennett has spent many years in the Orient and in these Islands.

The principal stockholders of the Philippine Railway Company are Messrs. J. G. White & Co., Mr. Cornelius Vanderbilt, Wm. Salmon & Co., and Heidelback, Ickleheimer & Co., bankers of New York, and Mr. C. M. Swift of Detroit. Mr. Swift was one of the promoters of the Manila Electric Railroad and Light Company.

ORGANIZATION OF LOCATING PARTIES.—Chief Engineer Beard has organized five locating parties, three of which will operate in Panay under the supervision of Mr. J. M. Robinson. Another party will operate in Negros under Mr. C. H. Farnham; and another in Cebu under Mr. H. F. Howe. Each party consists of 20 men, of which only eight are whites, and these will conduct the engineering work. All supplies for field work, such as instruments, tents, cots, filters, etc., were packed and shipped out from New York in such a manner that they could be transferred to the field in their original packages without the necessity of being repacked here. The equipment for the pack trains and saddle horses was made in Manila by Messrs. Pickett & Roberts, manufacturers of harness and saddles, and is the best that first-class workmanship and materials can produce. Native ponies will be used exclusively in the locating work, and as the surveys and construction progress tents will give place to permanent bungalows for the engineering parties and construction gangs, their location depending entirely upon the demands of construction. The field parties will be expected to live off the country almost entirely, so that the natives there will find a ready market for their produce.

MEDICAL SERVICE AND SANITATION.—The chief engineer intends to establish a competent medical and hospital staff, which will be under the direct supervision of a chief surgeon whose selection is yet to be made. As the principal plant and supply depot for construction will be at Iloilo, a general hospital and the office of the chief surgeon will also be located there. It will be the duty of the chief surgeon, besides instituting a modern system of sanitation at all the camps, and instructing the members of the parties in tropical sanitation, to look after the general health of all employees. Each camp will be provided with necessary medicines and surgical supplies for emergency treatment, and as far as possible local doctors will be enlisted to attend these camps professionally at stated times and thus assist the chief surgeon in his duties. Mr. Beard says that the health of the engineers will be his first consideration, and to insure efficiency the medical branch of the construction will be organized along the lines of the army medical department and hospital corps.

CONSTRUCTION TO BE CARRIED ON ROTATIVELY.—The construction of the railroads will be accomplished rotatively, beginning in Panay. It is hoped to have all the survey work finished in time to begin construction at the commencement of the next dry season. Immediately after the locating parties on Panay complete the surveys of that island, they will be transferred to Negros and Cebu to assist in completing the work there. All supplies and materials brought from the United States will be shipped direct to Iloilo, and shipped from there according to the demands of construction.

UNIQUE FEATURES OF THE CORPS.—Fifty per cent of the engineer corps under Mr. Beard is made up of college graduates, and the party is the largest of its kind that has ever left the United States on a similar construction expedition. The chief engineer caused

(Continued on page 7.)

CONSTRUCTION OF THE SHANGHAI TRAMWAY SYSTEM UNDER WAY

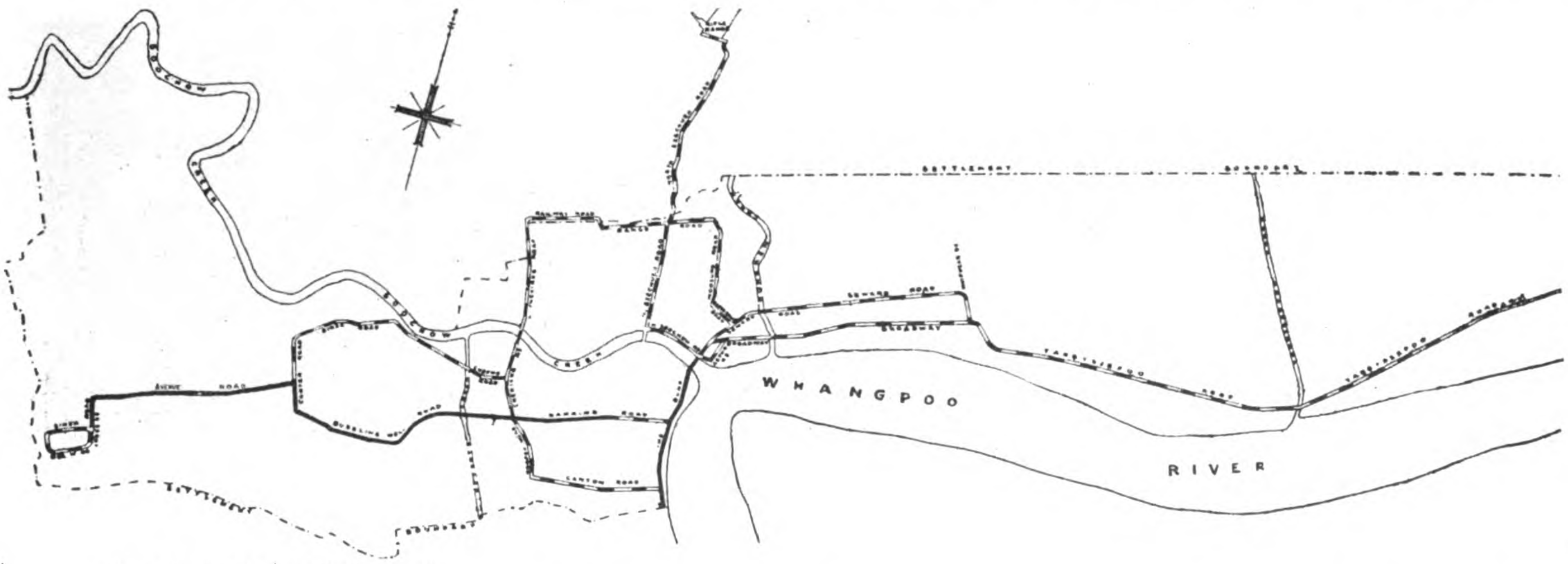
The construction of the Shanghai Tramways system is now under way. Ground was first broken by what is called the 4-mile post on the Yangtszepoo-rd., with considerable ceremony, and since then the contractors, Messrs. Bruce, Peebles & Co., Ltd., and the Shanghai Electric Construction Company, Ltd., have put large construction forces on the works.

When completed the system will consist of 23 ms. of track, including double track, and the gauge will be of 1 meter, or 39.3705 ins. The double line will commence at Bubbling Well-rd. at the intersection near the Chinese Garden, and will extend down Avenue-rd., Carter-rd. and Bubbling Well-rd. at the Bund, with the exception of the small piece of line between Kiangse-rd. and The Bund. According to the *North China Daily News* it has not yet been definitely decided whether the latter piece of line shall be single or double, but there is much to be said in favor of a double line in this narrow, crowded thoroughfare. The line along The Bund from the Yangkingpang and to the Astor House, at least, will be double with a single line down Broadway and another single line up Seward-rd., from Muirhead-rd., turnouts on both being arranged so that in the event of the roadway being taken up for repairs the cars in the other street will be able to run in both directions. From the Astor House a single line will run to the North Scechuen-rd. and a single track with switches will be constructed up the North Szechuen-rd. and the Extension to the Rifle Range terminus.

CAR SHEDS AND TROLLEY SYSTEM.—The car sheds will be erected at Bubbling Well near the cemetery, and accommodation will be provided for over 60 cars—in fact 63 have already been ordered. The cars will be convertible so that in the summer the sides will be open and the seats fixed across, while in the cold or wet weather the sides will be closed and the seats longitudinal. Each car will provide seating accommodation for eight first-class and 22 second-class passengers. The first and second-class compartments will be quite separate.

The tramway is to be constructed on the overhead trolley system, and the power will be supplied to the company by the Municipal Council from the electric light works in Fearon-rd. The power will be distributed from the works by cables laid under the footways, roads or gutters, in troughs filled up with bitumen. It was pointed out at the last ratepayers' meeting that the Municipal council will need additional machinery at its works to generate the additional quantity of power required, and it is understood that steps are now being taken to meet this necessity.

RAIL LAYING AND STREET PAVING.—The rails will be laid on 6 ins. of concrete, and along The Bund and the narrow part of Nanking-rd., wood paving will be laid between and 18 ins. each side. The rails weigh 95 lbs. per yard and they are of British standard design with a slot rather less than 1 in. in width. It is contemplated that as soon as the laborers grow accustomed to the work of construction the contractors will be able to lay down ½ m. of permanent way a week.



From the "North China Daily News"

PLAN SHOWING THE ROUTES THAT WILL BE TAKEN BY THE SHANGHAI TRAMWAYS; FIRM BLACK LINE REPRESENTS DOUBLE TRACK AND BROKEN LINE SINGLE TRACK

RAILWAY CONSTRUCTION IN BURMA

(Written for the "Straits Times" by Phila Penn.)

The Indian Railway Board, one of the last creations of the Curzon administration, has just completed its first year's labors by a tour of inspection over the Burma tracks. The board was constructed simultaneously with the new Department of Commerce and Industry, and two out of three of the members won their spurs on the Indian lines. Mr Upcott, the president, had for many years the supervision of railway traffic in Northern India, and Mr. Wynne, his colleague over the Bengal Nagpur, Northwestern, and Great Indian Peninsula systems, has acquired an extensive knowledge of local circumstances, which make him well fitted to advise on matters of detail connected with railway construction and management. These aids, supplemented by the wide experience of the third member on British, continental, and American tracks, should make the new bureau a tower of strength in the deliberations of the Simla Council when railway matters come up for consideration.

An Imperial Issue.—The tour of the board, extending from the extreme W. railhead to the farthest N. limit on the E., is one of imperial import, and, if the results are not pigeonholed in the Simla archives there to rest till the next official convulsion rouses them to activity, considerable stimulus will be given to British imperial interests both in the E. and Far East. The NW. frontier of India has of late years had increasing attention, and every once in a while when political heat waves have expanded official minds, the eastern boundaries of Further India have received some little consideration. But the general *laisser faire* policy of the British foreign office, and its failure to hitherto recognize the political and commercial importance of conquest by railway, have been vital factors in rendering that attention abortive and materially retarding those imperial interests to advance which is one of the fundamental principles of their constitution. The effect of this has been seen in the almost criminal neglect in affording the means necessary for the opening up of foundaries to foreign trade, and where practicable to give support to native commercial enterprises —in the seemingly lasting determination to clog industrial progress and cripple trade expansion.

Pacification of the Frontier.—Notably is this so in the case of Upper Burma which has just attained its majority under British rule. Of course in the earlier years of its acquisition much had to be done in clearing the country of the hordes of dacoits who came over the border, but for the past 6 yrs. or so there has been a gradual settling down to law and order, and crime on the highways has been reduced almost to a minimum. In the Southern Shan States, on the Chindwin Hills, and away on the extreme E, border, lawlessness in its violent forms is almost of the past, and trade goes on as secure as that in Lower Burma which has lived the proverbial allotted span of years under British administration. To accomplish this pacification has been a colossal task, and many of the pioneers, now beyond this mortal ken, pass in review in grateful remembrance as the visitor travels in absolute security on railroad or river.

Primitive Transport.—To, however, sufficiently realize the difficulties labor and capital have to contend with for want of communications in Burma, one has only to travel to her inland centres of industry, access to which is only gained by the most primitive modes of transport. The oil wells at Yenanyoung are far from the iron track, and to reach the Ruby mines conveyance by a far from polished road is necessary. The headquarters of three commissionerships, viz., Moulmein, Akyab, and Minbu, have no railroad communication at all with Rangoon, while the vast area of Arakan is neither connected with Burma by rail nor river, not even by a metalled road, and Sandoway is entirely cut off from sea communication during the south west monsoon. There is no rail track to the Southern Shan States, and they can only be reached by a very inferior hill-road. Even in the S. which has had its

present railway connections with the commercial capital for nearly 4 yrs., the roads are very inferior, and cultivators experience much difficulty and hardship in conveying their produce to market, or to the banks of the Irrawaddy for shipment in the flotilla steamers.

Rude Awakening.—This apathy to meet the growing needs of the province has long been a source of wonder to those who are concerned in eastern industrial and commercial reexpansion, especially when every financial turn records increased revenue. Unhappily, the relations existing between the local government and that at Simla have been rather strained of late, and something approaching a deadlock in the through passage of administrative details has resulted. Under the new viceregal régime, however, much has been done by the *suaviter in modo;* much more by the *fortiter in re*, and all things working smoothly we may hope to see the country in the near future fully opened up to trade with the lines of communications to the various centres completed and in full working swing.

Line to the Frontier.—It is, however, with the extension of the Burma system to the China frontier and beyond that the chief public interest in the report of the railway board will be centered, and the liveliest satisfaction will be evinced if the work which has been undertaken to lay the rails between Bhamo and Momein is hurried on to completion without any administrative hitch. Momein, or Teng-yueh, as it is more particularly known in the Chinese vernacular, is about 120 ms. to the NE. of Bhamo as the crow flies, and is on the Burma trade route to Yunnan-fu, the capital of the Province. It is a town fast growing in importance as one of the principal trade centers of Eastern China. The fact that a customs station under European supervision has been established there for some years shows the importance which the Chinese officials have attached to it as a trade center, and now a British consul has been placed there to protect the traders who are at present dealing with the Burmans and Shans, and who do a large import and export business with Upper Burma. From Momein the road to Yunnan-fu presents very few engineering difficulties, and the country onwards to Suifu, the highest navigable point of the Yangtze for small craft, would be almost plain sailing. It has always been the idea of successive governments to connect Upper Burma with the British sphere of influence in the Yangtsze Valley, and a few years ago the Lashio-Kunlon extension was commenced with that end in view. Shortly before the Boxer outbreak a flying survey was made and a route to Yunnan-fu was projected. Another survey was made up the Nam Sing River from Kunlon, and a track was found which would tap three provinces, Yunnan, Szechuan and Kwangsi, and which would only necessitate the crossing of one range of mountains—the range dividing the Salween and the Mekong, and, up the river draining the Talifu Lake, tapped a lengthened area free from mountainous ranges westward of Tali-fu some 30 to 35 days journey from Bhamo. To the E. of Tali-fu it passed a plateau, estimated to be about 6,500′ above sea level on which were small picturesque mountains and valleys extending to Yunnan-fu. Before the diplomatic change, which placed Sir Ernest Satow in Peking, representations were made to the Chinese Government on the subject of running a line through Yunnan to the Yangtsze, but Sheng Ta-jen, the late Director-General of Chinese Railways, was averse to the scheme and it fell through. Since then nothing has been done, and there still remains that great obstacle to railway development and trade with Eastern China —the apparently hopeless conservatism of our own Far Eastern policy—the policy of drift.

Trade with Yunnan.—It is impossible to over estimate the commercial advantages which would accrue, if Burma was fully opened up by rail with Yunnan. Already the volume of trade with the Yunnanese is by no means confined to a few petty traders. A large import and export business is carried on, the continuance of which must depend on the absence of competition by the Red River route to Indo-China or to the SE. by means of the Canton River. In the Yunnanese valleys two crops of rice are grown every year, and beans, sugar-cane, peas, etc., thrive in abundance in well-irrigated soil. The province is a veritable fruit garden, some of the products being up to the standard of those grown in California. Pears, much resembling those reared in Tientsin, and apples with almost as rich a flavor as the Devonshire product, are grown in orchards stocked with peaches, plums, apricots and strawberry beds. In the forests chestnuts and walnuts are plentiful, and on the plains vegetable gardens yield a capital return for the assiduous attention paid to them by the cultivator freed from the terrors of landlordism which retards somewhat the enterprise of his Burmese neighbor over the border. Cattle breeding on the hillsides finds lucrative employment for a large number of Yunnan shepherds, and over extensive areas mules are bred in their thousands, and are largely used in the transport of produce to the western outlets.

Yunnan's Mineral Resources.—The only serious obstacle to the rapid development of the mineral resources of Yunnan lies in the cupidity and corruption of the native official. The province is stated by prospectors, whose words may be readily accepted, to be rich in gold, silver, lead, iron, copper and tin, and although the Yunnanese have worked with the most primitive means at their disposal, their labors have been profitable. To the E. of Yunnan-fu are some coal mines, the mineral comparing very favorably with the Shansi product or the Miike mines of Japan. Salt is somewhat plentiful in Yunnan and there are indications of oil wells being in many of the valleys. Enough has been said to show how great is the value to be placed upon the opening up of Burma to Yunnan trade and how much will be lost if there is any further hesitation, delay, and nervousness while other influences are steadily plodding towards the much desired end.

Connection with Moulmein.—As far back as the early '80s, and long before the acquisition of Upper Burma, the proposal to connect Moulmein with Rangoon came on the *tapis*. The Bombay Burma Trading Corporation—a body of capitalists who were responsible for King Theebaw's overthrow—saw in the project much that was in harmony with their ideas of monopolising all that was valuable in the exportation of teak, principally to Europe, where at that time the logs were fetching an abnormally high price. The directors were practically pseudomembers of the administration, and the influence they wrought made itself felt irrespective of the needs of the hour. A report on "the absolute necessity of additional means of communication with Rangoon" was drawn up, and submitted to the Government of India, but it was ultimately vetoed by the imperial government on the ground of inexpediency. Subsequent to this from time to time the "need" has been emphasized, and just before Sir Hugh Barnes left the province he referred to the subject with much warmth and "how much remained to be done to develop its (Burma's) latent resources. It was difficult to realize. Sir Hugh said, that after 70 yrs. of occupation the only way to reach Moulmein was by steamer from Rangoon, and Akyab was in a position that she could only be reached once a week by sea. How far the railway board will share Sir Hugh's dismay remains to be seen. Certain it is that starting the construction of the line to Moulmein is one indication of future effort—effort which must redound to the best interests of the province and the empire in the Far East.

Financial Aspect.—The continued retention of public funds, and the refusal of the central government to carry out works which have hitherto demanded their most urgent and serious attention are matters of history, but they may be well considered, viewing the financial aspect, and seeing how far the burden would have to be borne by either the central or imperial government. Since the acquisition of Upper Burma, the province has increased in population by nearly 200 per cent. Her contribution to India during 1903-4 was Rs. 3.6 per head of her population, and during the following 12 mos. her revenue had so increased that it reached Rs. 4 per head twice as much as that contributed by the aggregate population of the provinces of Bombay, Madras, Punjab, and the United Provinces. And yet, withal the Government of India have seen fit to take up an uncompromisingly exacting attitude on matters of public utility, and are systematically plundering with murderous intent the highly-fattened goose which has been laying her golden eggs. Further more the penny-wise and pound-foolish policy of three governments has resulted in a considerable diminution of the teak trade, and Burma is fast losing its position as the main source of the teak supply of the world. Much of this is due to the areas now being less accessible, and the government monopoly which drives price up to the extreme limit. In short, Burma, while contributing more than she can afford, consistently with her own development, is denied even a share of that assistance which appears to be so lavishly showered on other portions of the British realm.

FIRE FIGHTING APPARATUS IN CHINA

The construction of native houses in Shanghai, as well as in nearly all other large Chinese cities, being principally wooden, renders the danger of destructive fires great, and, as a consequence, through the desire of the people themselves and by reason of the demands of the insurance companies, there has been quite a large sale of fire extinguishers of many kinds. Nearly every foreign and many native importing houses handle these extinguishers and several agents are constantly at work. The losses from fires in Shanghai are heavy, and yet, under the careless methods of the Chinese as to protection from fire, it is remarkable that the amount is not much greater. No accurate statistics in regard to this fire loss are obtainable. It is to be believed that the Chinese will welcome improved fire-fighting apparatus, although one gains the impression by viewing their daily life and observing their habits as to fire-producing agencies that they are indifferent to the results. The only fire protection of the international settlement at the present time is the volunteer fire brigade, the municipal waterworks, and the various patent extinguishers.

THE FAURA BAROMETER

Last month The Far Eastern Review mentioned that La Esmeralda, "of Paris and Manila," was the exclusive manufacturer of this famous maritime instrument. There was a slight inaccuracy in the designation of the places of business of the firm in that the head house of La Esmeralda is located in Manila, and not in Paris. Orders for the barometer should be given to the Manila house.

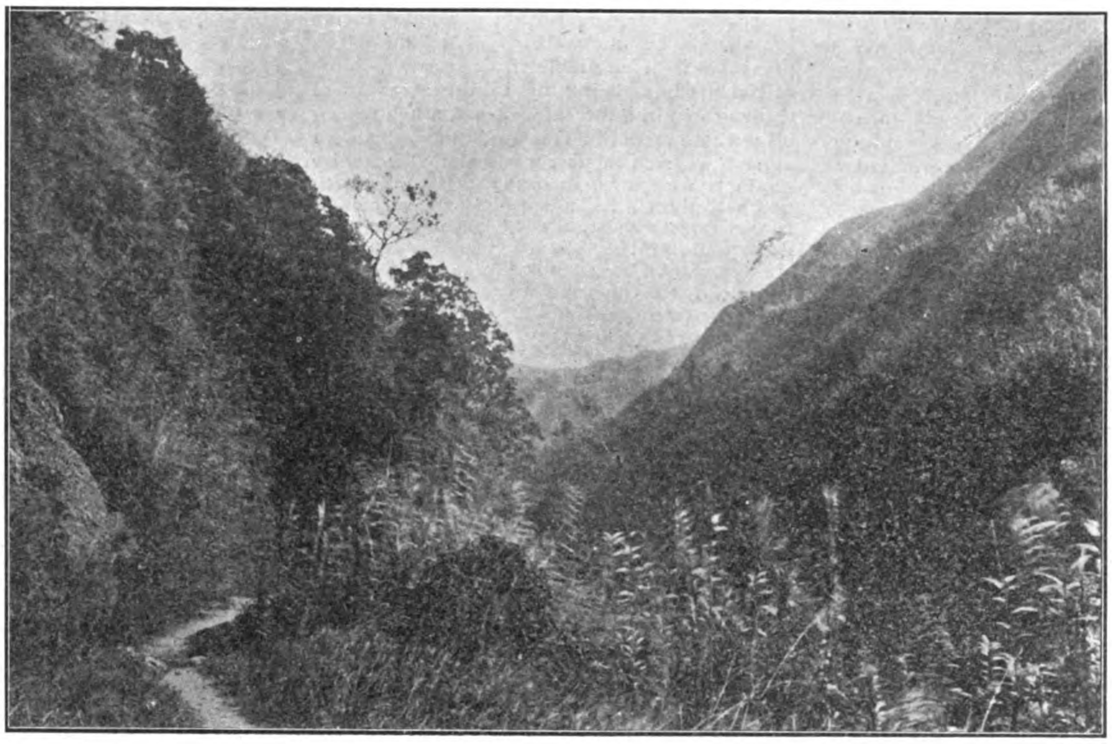
ENGINEERS BEGIN THE SURVEY OF RAILROAD ROUTES IN PANAY, CEBU AND NEGROS, P. I.

(Concluded from page 5.)

the members to rendezvous at Kansas City from all sections of the United States, and from there the party went across the continent to the port of embarkation. Mr. Beard's headquarters will be in the De La Rama building at the foot of the Santa Cruz Bridge, Plaza de Goiti, Manila, where he and his staff will occupy the suite of offices recently vacated by Messrs. J. G. White & Co.

PRELIMINARY RECONNOISSANCE OF THE MANCAYAN-SUYOC MINERAL REGION, LEPANTO, LUZON, P. I.—II

(By ARTHUR J. EVELAND, M. E., Government Geologist)



MANCAYAN RIVER VALLEY

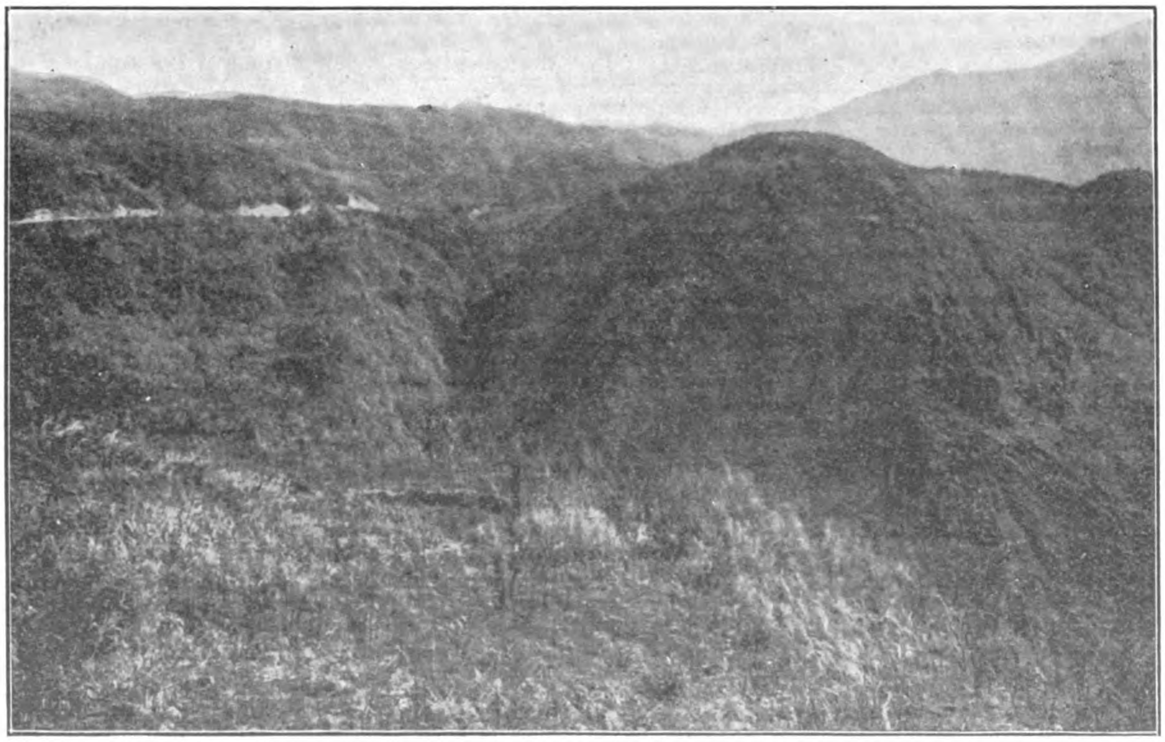
CHAPTER IV.

TOPOGRAPHY.—Northern Luzon, above the 16th parallel of N. latitude, presents fairly uniformly a single topographic type. It is characterized by parallel approximately N.-S. mountain ranges, with extensive longitudinal valley systems. Broadly speaking, almost in the center of the island is the main chain, the Cordillera Central, and its extensions, the Cordillera del Norte and the Caraballo Sur, which forms the main watershed of Luzon. Two coast ranges, the Sierra Madre of the Pacific Coast, and a series of somewhat irregular ranges on the W. coast, under a variety of names, mark, with the main mass shown the roughly parallel system of mountain range and valley. From the central cordillera transversal valleys modify the regularity of the structure, and present, in central Northern Luzon, a broken and irregular appearance, the region immediately to the E. of the Cordillera Central being particularly irregular.

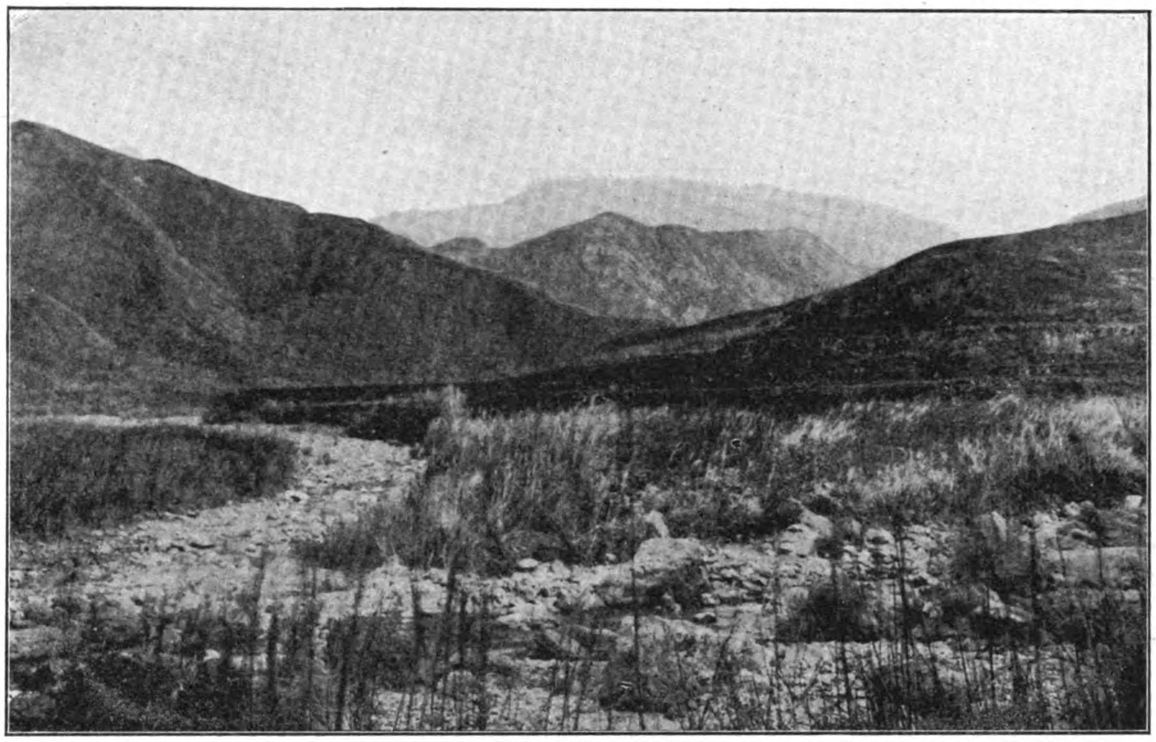
Denudation is the keynote of the topography, and although the immediate E. and W. boundaries of the area more closely connected with the territory under mining investigation depend to a greater or less extent on the structure, the limiting ranges on the sides being tectonic in type, late volcanic action and extreme degradation have combined to produce topographic forms unclassifiable under one head.

The regions of Mancayan and Suyoc are at the head of the Abra Valley, which has resulted from the breaking down of an anticlinal arch of wide extent, and possibly, to some degree, to faulting of the same.

On the W. of this valley lie the Cordillera del Teila, an escarpment of westward-tilted sedimentaries rising some 4,000′ above



SOUTH FROM MANCAYAN, SHOWING MANGAMBANG RIVER GORGE



MANCAYAN RIVER AT BUGIAS

the level of the sea, and here on the E., having a precipitous slope to the valley of the Abra (at Angaqui), at the foot of Teila Pass, of 3,000'.

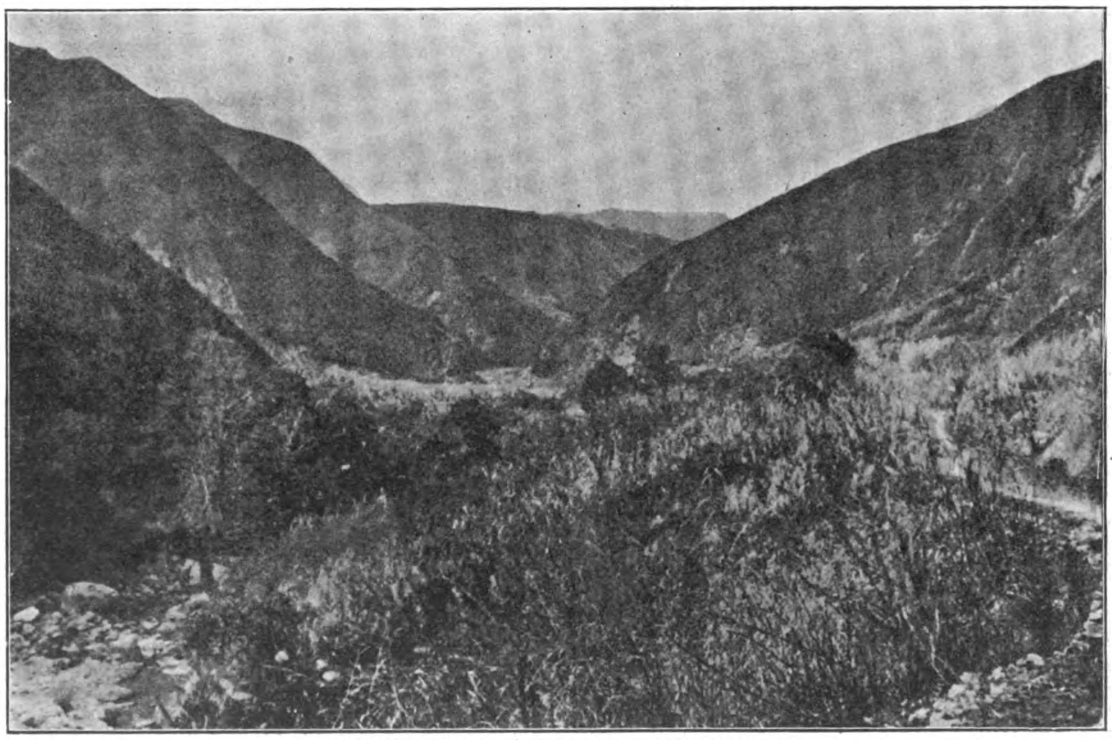
On the E. the main watershed of the Cordillera Central marks the boundary of the province, and similarly this range is flanked on the E. by tilted sedimentaries. The valley is terminated at the S. by spurs in a NE. direction, which also mark the boundary of Lepanto Province.

The topography of the immediate area of the mineral exploitation is therefore of a limited area only—that of the head waters of the Abra River. Situated as this district is, on the flank of Mount Datá of the Cordillera Central, and closely surrounded by the limiting ranges, the topographic forms are dependent to greater measure upon drainage and subsequent degradation than upon structure. The sedimentaries to the W. are some little distance from this region, and those to the E., though uncovered by river action only at the immediate eastern side of the mineral district, have been buried by late volcanic material to a considerable depth. Drainage from this region is directed altogether to the N., ultimately, and the generally northern trend of the valleys in connection with the usual radial type of mountain mass erosion produces the resultant deeply eroded surface.

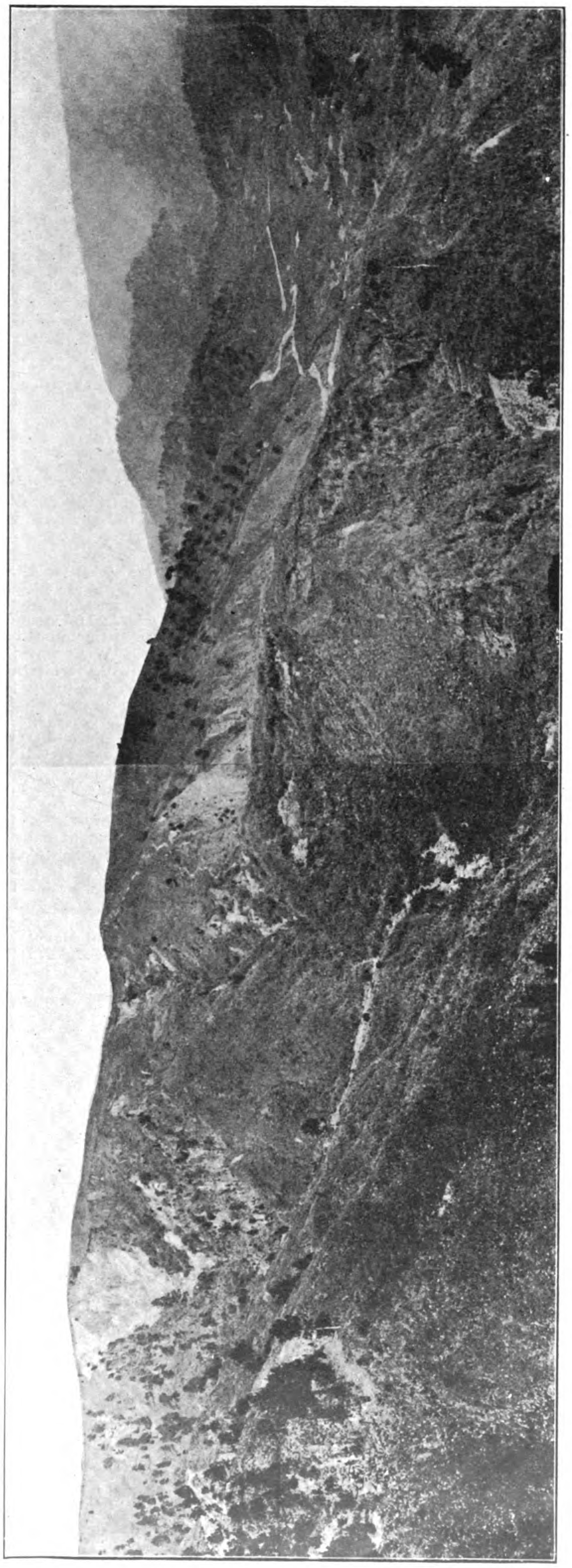
The small area over which mining and prospecting are being carried on rests on the W. slope of Mount Datá, and a spur which extends from that mass to the W. As a whole, the slope of Datá to the western side is uniform, forming an irregular conical mass, around the base of which runs the Abra River and its tributaries. On account of rainfall conditions the erosion has been marked, and steep gorges, V-shaped, are the rule. The upper volcanic rocks of the eastern portion of the region are of a yielding nature, and erosion produces rounded forms, *hogbacks*, and mounds, giving a quite regular slope to the immediate base of Datá; further to the W., where the rock masses are harder, and in the intermediate areas, where the streams cut through into the hard material beneath, the steep-sloped ravines predominate, and the drainage is divided so carefully that ridges and spurs give at the top but space for a foot trail. Lateral erosion has been deep and rapid, and a general topographic map of a large area will show a well-dissected region.

The towns of Mancayan and Suyoc are situated on the top of the less resistant material spoken of and the appearance of the area around them, rounded and rolling, is in decided contrast to the steep slopes and rapid fall of the gorges and river channels at their immediate boundaries.

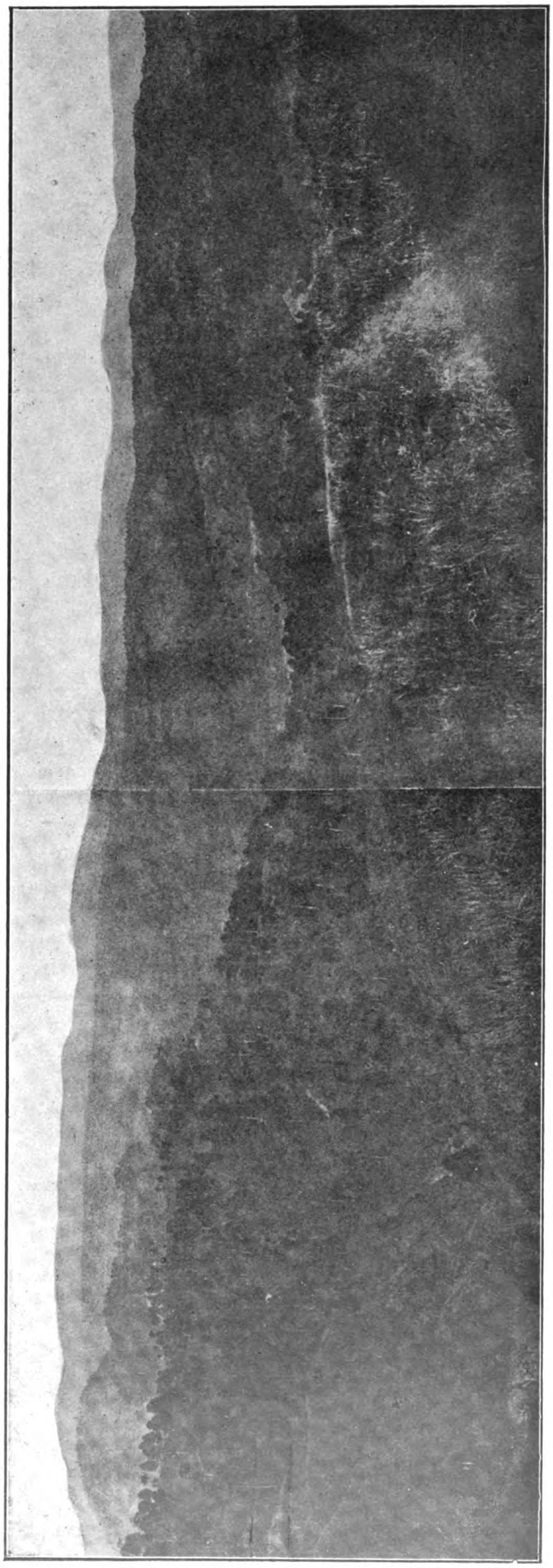
HYDROGRAPHY.—The region of Mancayan, situated, as it is, on the slopes of Mount Data,



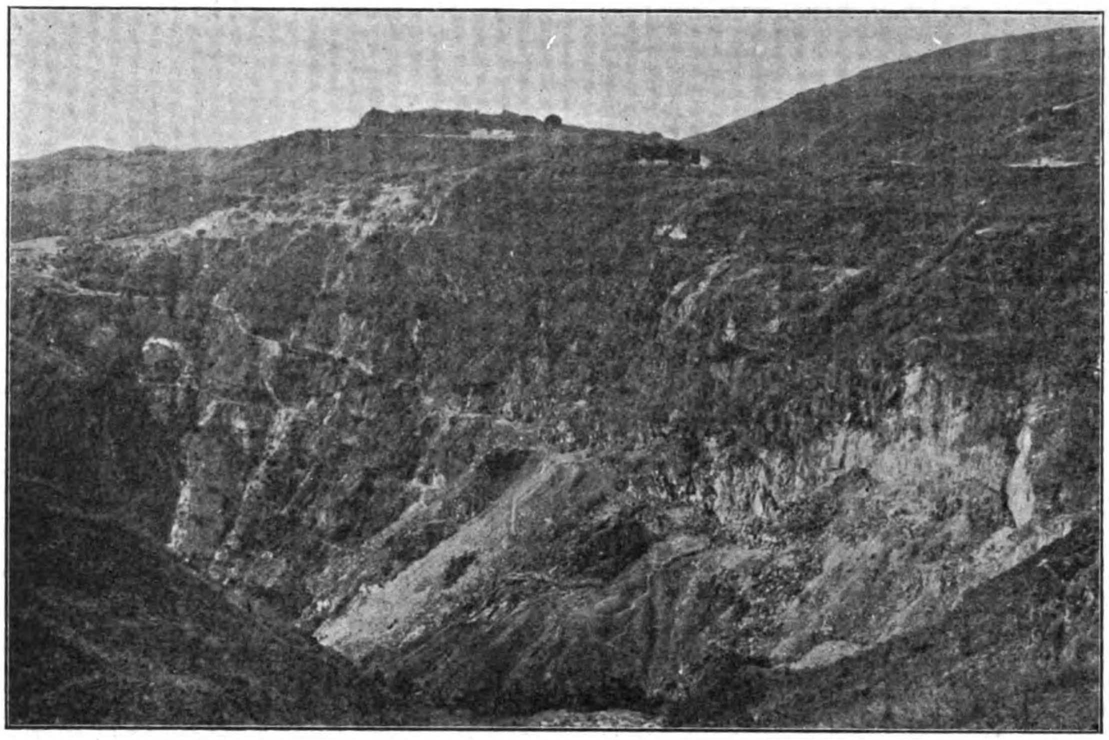
MANCAYAN RIVER VALLEY ABOVE BUGIAS



SUYOC AND THE UPPER VALLEY OF THE ABRA



TOPOGRAPHY EAST OF SUYOC



COPPER MINES, MANCAYAN

is well drained by numerous streams, chief among them being the Abra and its tributaries. The course of the Abra proper is somewhat peculiar. It rises a little S. of Mancayan, flowing in a *southern* direction, for a short distance, describing a semicircular course, through well-cut, V-shaped gorges to Comillas, NW. of Mancayan. From there on the course of the river is normal, winding through the broad valley between the Cordilleras de Teila and Solis.

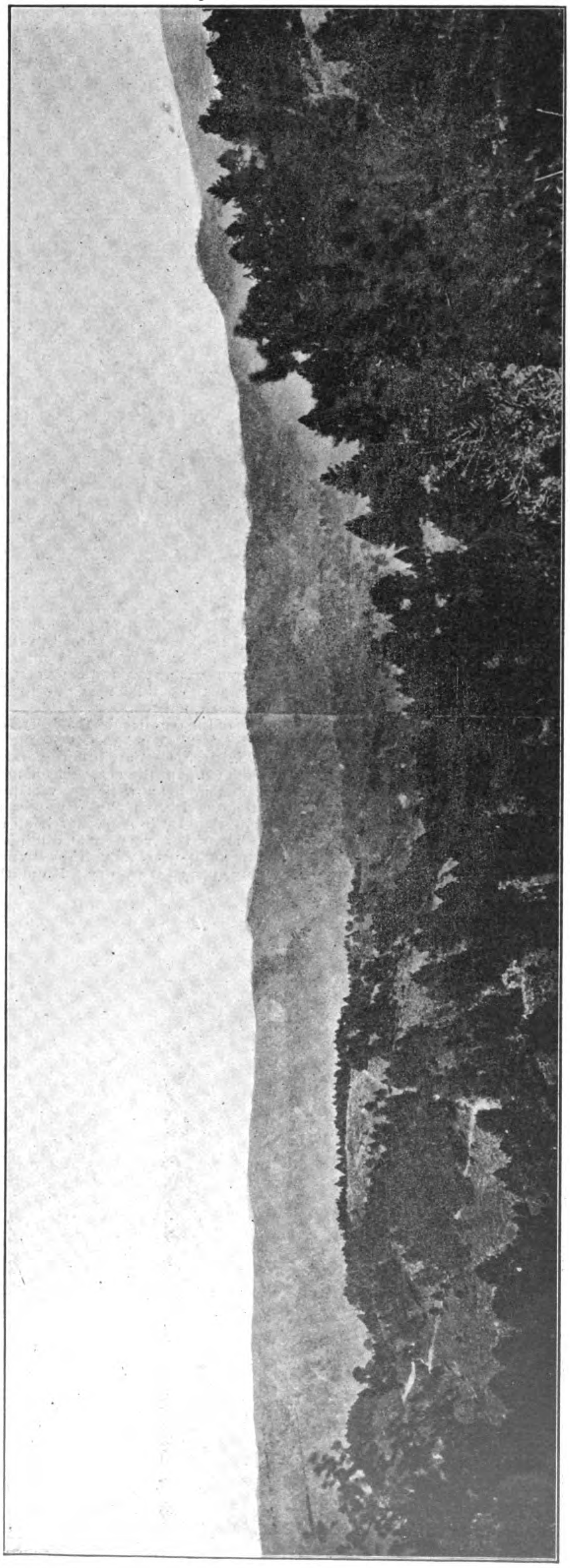
Starting from Tuboc, the barrio nearly in the center of the district, the Mancayan River cuts an almost straight path to its junction with the Abra at Comillas. At a short distance from its origin it is entered on the E. by the shorter stream known as the Mangambang, or Tabio, which rises on the Aban spur of Mount Data, and cuts the gorge of some 500′ through the deposits of copper at Mancayan. Farther to the E., on the upper slopes of Mount Data, the river early develops power, and, flowing westward for 1 or 2 ms., turns abruptly to the N. at a right angle, and finally debouches into the Mancayan at Baguis, 3 ms. above (S. of) Comillas.

The River Maanse has its origin south of the Mangambang, or Tabio, on the same spur (Mount Aban), flows W. to Tuboc, thence S. to Cayan, where it is met by the gullies draining the northern side of Suyoc Hill, and then in a westerly direction pursues a winding course through steep, V-shaped gorges to the Abra, several miles SW. of Suyoc.

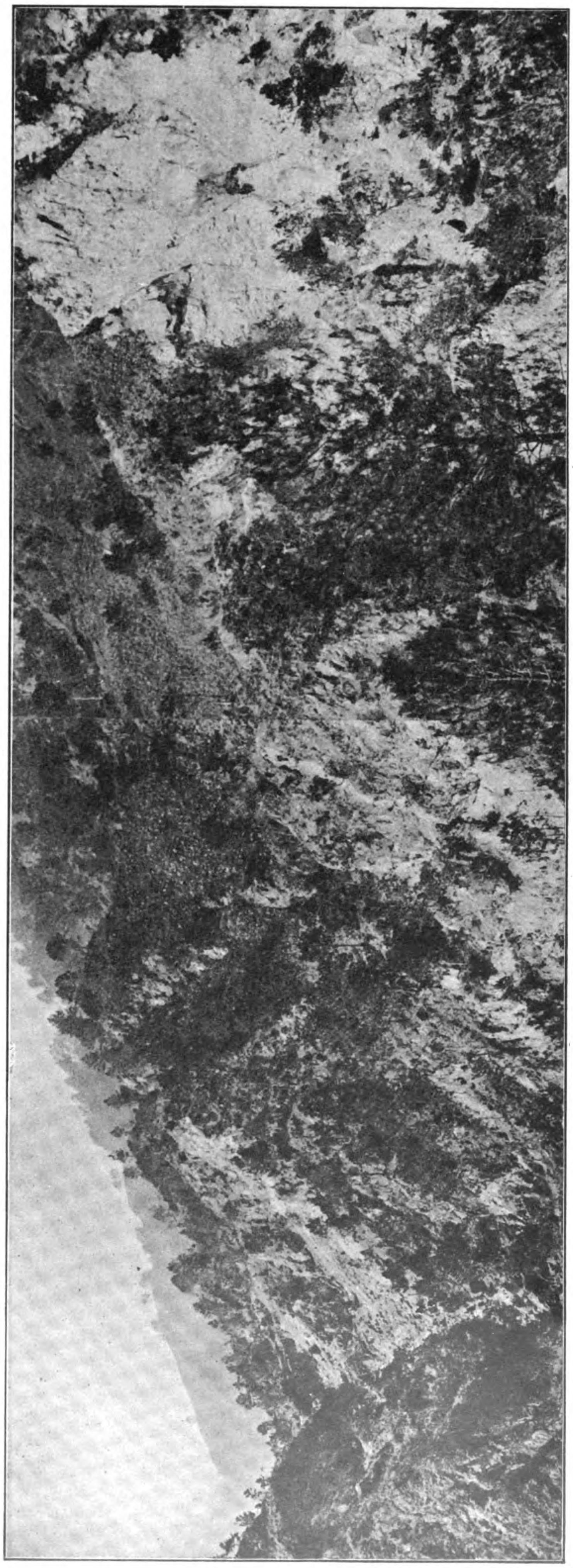
The topography and geology of the region have affected the drainage to a considerable extent, as will be spoken of later. The rivers N. of Mancayan present the usual condition of mountain-river type—the torrential water course, heavy falls, a swift, deep-gorge-cutting stream debouching into the broad valley below. But S. of Mancayan irregularities of drainage are met with that indicate certain orographic changes and influences due to the nature of the rock masses.

All the rivers of the region could be described as in first and second stages of development, with steep declivities. They are to considerable extent dependent upon the seasonal changes for their volume and show large variation between extremes. During the dry season, only the springs and the *old* water keep up the volume. There is a very great diminishment in volume and power, though the streams do not by any means run dry. From the beginning of the rainy season the river steadily increases in size, and becomes, after the occasional, long, steady torrents of rain, tremendous confined floods. Until the water

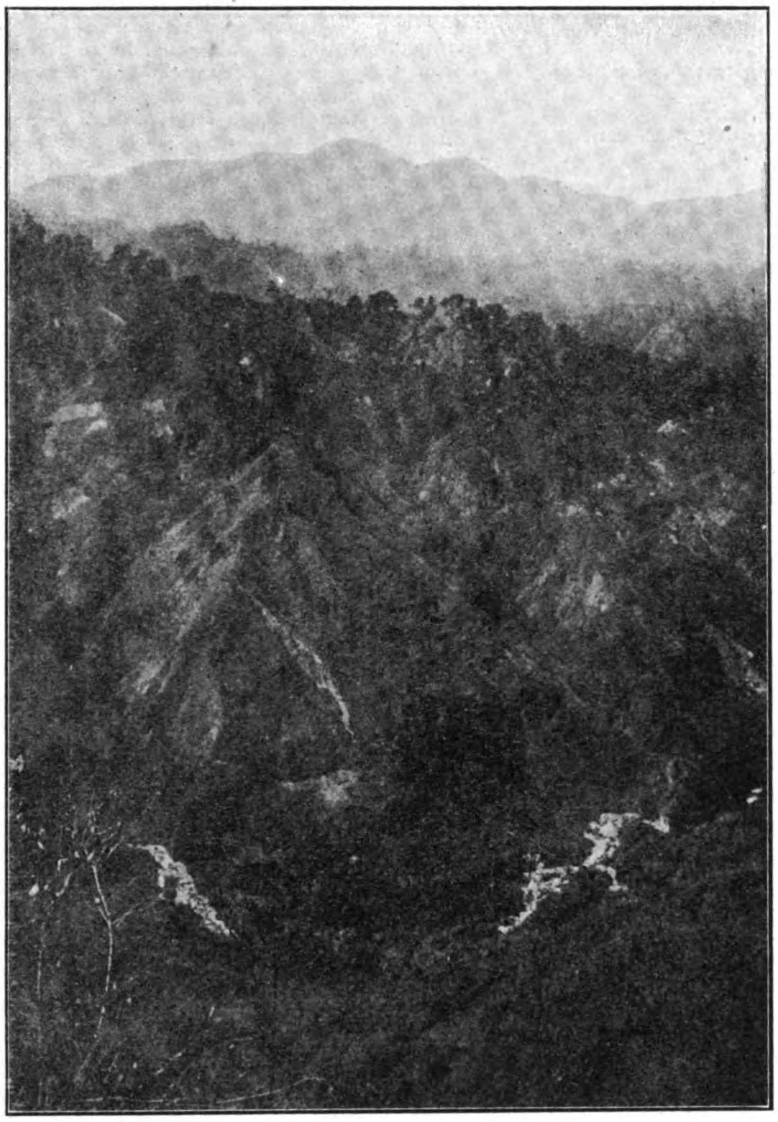
TOPOGRAPHY ON MAANSE RIVER



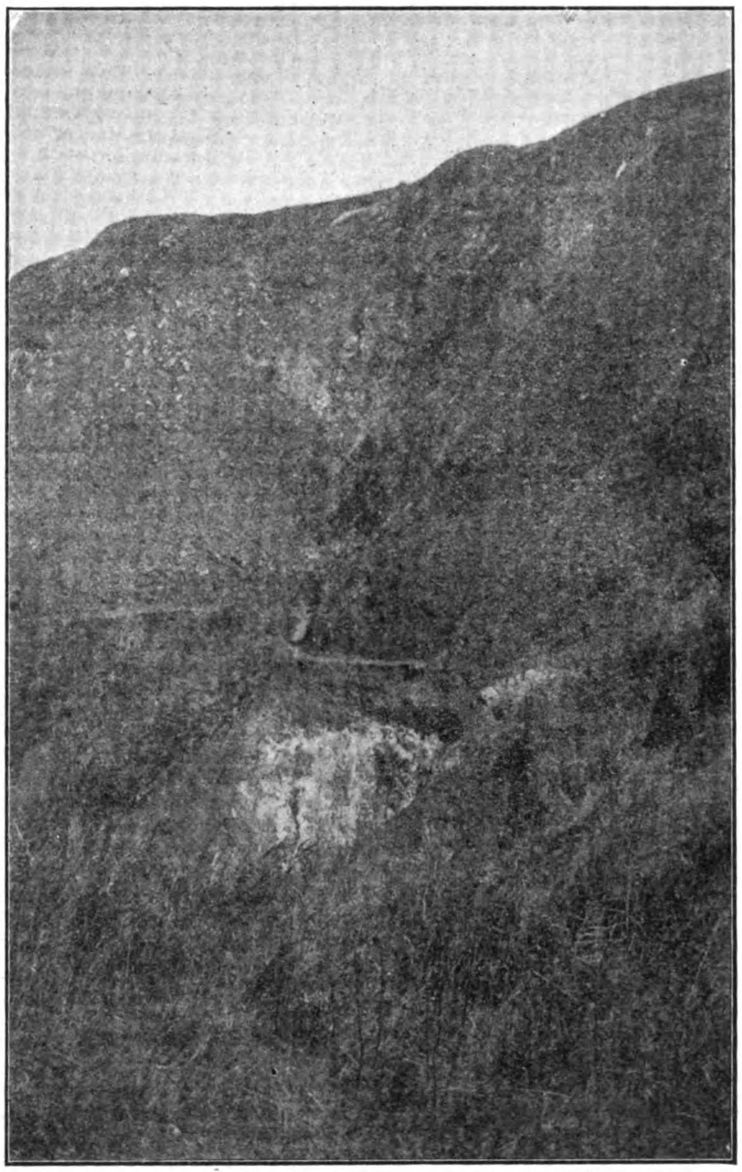
SUYOC HILL FROM BENGUET-LEPANTO DIVIDE



IGOROT WORKINGS AT SUYOC



MANCAYAN RIVER GORGE, WEST OF MANCAYAN; MOUNT MALAYA IN BACKGROUND



OLD SPANISH ROAD TO COPPER MINES, MANCAYAN, SHOWING CONTACT BETWEEN OVER LYING QUARTZ-PORPHYRY AND MANCAYAN DIORITE

reaches Comillas there is, in the case of the upper valley of the Abra, no chance for expansion over any considerable area, and in consequence the rapidity and power of these streams is something astounding. Streams which were but knee-deep and a few feet in width become torrents that a horse can not ford. Under these conditions erosion has been rapid and has its effect in the topographic form.

The Abra River waters above Suyoc and those of the Bat-Bat River to the E. are hardly potable from the viewpoint of the European while the streams heading up in the mineral region, as the Maanse, Pacat, Mancayan, are extremely bad. A great amount of copper and iron salts is present, as well as arsenical soluble salts, and certain springs are quite poisonous. At the meeting of the Mancayan River, which is very clear, and the Mangambang River, slightly milky and brownish, there is deposited a vivid blue film or coating in the bed, which diminishes in intensity for fully 2,000′ downstream, and the vivid blue color of the water and of the blue-coated bed produced by the chemical reaction is plainly discernible from the tops of the surrounding ridges. The explanation of this unusually strong reaction lies in the fact that the Mangambang River, as heretofore stated, cuts directly through the deposit of the copper minerals, of the old mines, and the Upper Mancayan River drains an area more or less shattered and decomposed, with a great deal of altering iron sulphides.

The occurrence is so striking that in previous times it certainly should have been and probably was an index finger to the prospector.

There are, however, many springs among the extraordinary number with which the district is watered, a number of which give cool, clear, and pure (no analysis made) water. These waters are fairly potable.

Hot springs, while not flowing in the immediate area under consideration, are prevalent all through this mountain region. In the Province of Benguet, some 40 ms. to the SW., there are numerous active springs, which are sufficiently large in volume and temperature to be worthy of considerable attention. And in Lepanto Province, to the N. of Mancayan, there exists a similar region. The nearest of these occurrences is at Comillas, less than 10 ms. NW. of Mancayan on the trail to Cervantes, where the trail crosses the River Abra. Here there is a small hot spring which has been described by Centeno, under the Spanish régime, as a ferruginous sodium-chloride spring.

At Cervantes, in the flood plain of the River Abra, by which it is covered at periods of high water, are several springs, or, in all probability, several vents of the same spring, within a comparatively few feet of one another.

On these springs, as well as many others of the Islands, the Spanish Government made more or less extensive reports, and the following excerpts are chosen from the reports mentioned, as of some value. Of the Comillas springs, Centeno says:—

"It gushes out of an ancient wash of angular dioritic and other eruptive rocks, forming a small pool at the river, in which, notwithstanding the high temperature, which the human body hardly can bear, the Igorots are accustomed to bathe, with good results in the great variety of cutaneous diseases to which they are subject. From this comes the great faith in their waters, that these poor people have. Guided as they are by superstition in almost every act of their lives, they never bathe here without invoking the favor of the *anitos* of the spring, making a modest offering, which generally consists of a little *palay* or rice, which they throw into the pool."

Centeno gives the height of this spring as 460 meters (1,518′) above sea level; from the recent survey it is approximately 1,400′. A flow of 1.43 liters per second was recorded, or 123 cubic meters in 24 hrs. The water is clear, transparent, inodorous, and tastes salty; neutral reaction on litmus; no gaseous emanations; temperature of the water, 50° C. (the air, 26° C., December 17, 1886); density at 0° C. and 760 millimeters is 1.004375.

Analysis of 1 liter of the water is as follows:—

Content.	Weight. *Gram.*
CO_2	0.060000
Ca_2O (precipitated by boiling)	.006720
Mg_2O (precipitated by boiling)	.006882
FeO (ferroso) (precipitated by boiling)	.Trace
SiO_2	.074400
FeO (in the decanted liquid)	.180000
CaO (in the decanted liquid)	.086016
Na_2O	.268349
LiO	Trace.
So_3	.132532
Cl	.316652

Residue obtained by the direct evaporation of 1 liter of water and dried at 180° C. (approximately) weighed 0.851000 gram. It is calculated from the analysis that 1 liter of water at 50° C. contains in solution:—

Content.	Cubic centimeters.	Weight. Gram.
O	3.96 000	0.005669
N	7.930000	.009961
CO_2 (free)	17.556375	.034669
$CaCo_3$		.017280
$MgCo_3$		.021653
$FeCO_3$		Trace.
$CaSO_4$		.208896
$FeSO_4$		.018339
NaCl		.506678
LiCl		Trace.
FeCl		.016427
SiO_2		.074400
Total		.913972

The Cervantes spring issues from the margin of the river, at a height (Centeno) of 435 meters above sea level, at a rate of 0.24 liter per second.

The water is clear, transparent, uncolored, inodorous, with a slightly salty, hard taste. It gives out bubbles of gas, and the litmus paper shows a neutral reaction. The temperature of the water is 56° C. (air, 25° C.) and density at 0° C. and 760 millimeters is 1.004732.

Anhydrous substances in 1 liter of the water are as below:—

Content.	Weight. Gram.
Co_2	0.004000
SiO_2	.032000
CaO	.237440
MgO	.005125
Na_2O	.426687
So_3	.521888
Cl	.335456
Al_2O_3	Trace.
$CaCo_3$	Trace.
Organic matter	Trace.

Residue obtained by evaporation of 1 liter= 1.483000 grams.

Resulting from the analysis, it is computed that 1 liter of this water at 50° C. contains in solution:—

Content.	Cubic centimeters.	Weight. Gram.
Co_2	2.025598	0 004000
Air	10.689488	.013828
$CaSo_4$		.576647
Na_2SO_4		.324140
NaCl		.538121
MgCl		.012000
$CaCO_3$		Trace.
SiO_2		0.032000
Al_2O_3		Trace.
Organic matter		Trace.
Total		1.500736

Both these springs, it is claimed, have a decided medical value, and are largely used by the natives both for bathing and drinking purposes.

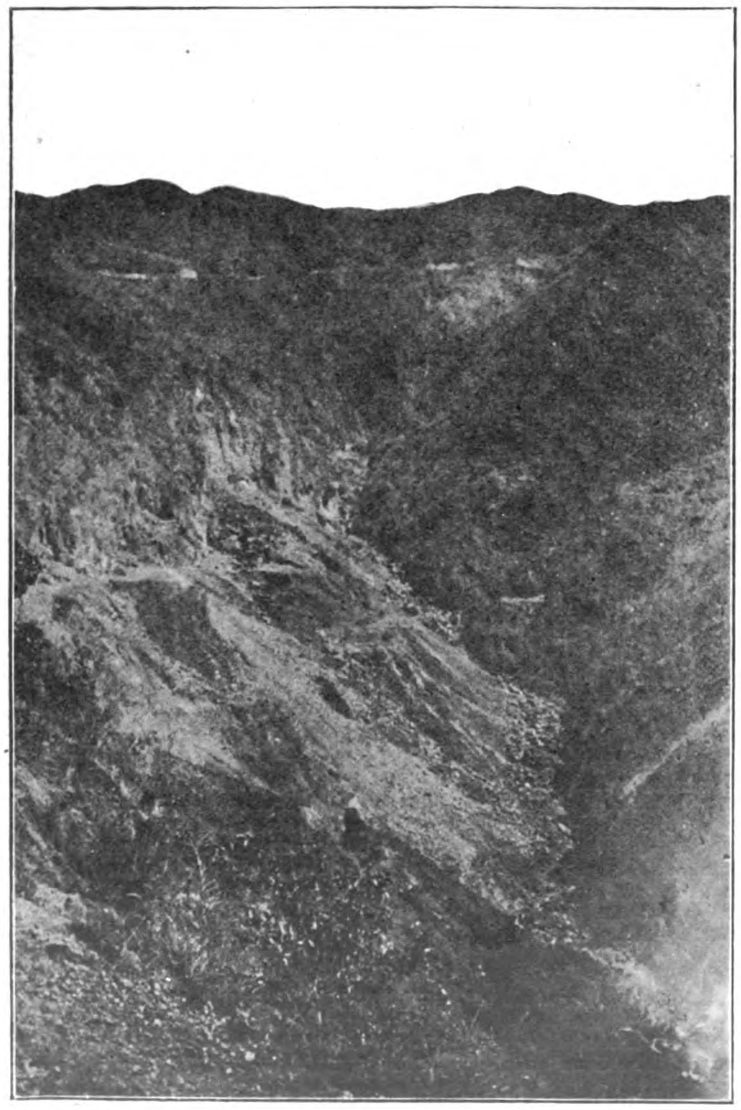
At Angaqui are other springs of a sulphurous nature, and in the eastern portion of the province are also many saline and hot springs, all of which constitute a feature of this and much of the rest of the Island of Luzon.

CHAPTER V.

General Geology; Local and Structural.—The geology of the limited area in which ore deposits are found is dependent, similarly to the topography, to a considerable extent on the general conditions of Northern Luzon. Up to date but little has been known of the geologic conditions north of the central plain of Luzon, and, aside from disconnected notes made by occasional visiting geologists, the geology of the entire northern part of Luzon was mere conjecture. The Spanish authorities made an occasional visit to certain localities, one of which (Hernandez's inspection of the Lepanto area) has already been noted, and, noteworthy among the others, Mr. R. von Drasche visited this area in 1875 and gave to the public his observations. Before these observations and deductions of Von Drasche, rapidly made but showing a thoroughly trained mind, the views as to the constitution of this part of the island were quite at a loss for some facts to tie to. Semper speaks of the *trachytic core* of the island, and the adjacent and overlying sedimentary strata of recent age. J. Roth, a short time later, compiling the information available at that time, states that "on a formation of crystalline schists" lie the Tertiary strata. Roth's conclusions were drawn from the observed occurrence of schists in the Islands of Cebu, Leyte, Mindanao, and in the Camarines Provinces of southern Luzon, and also the occurrences noted by Itier of stream pebbles at Angat, in Bulacan Province.

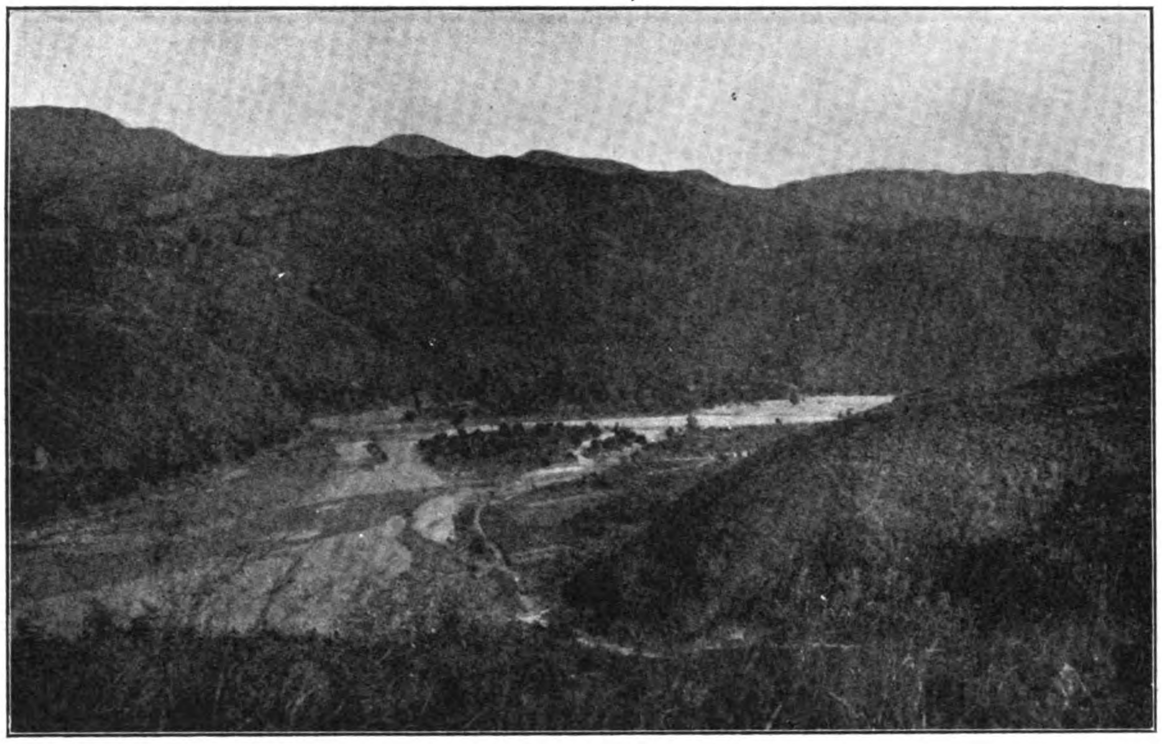
Mr. Becker in this report, which gives us the most complete and concise statement of all known information, draws the inference that the crystalline schists are predominant in the basal mass of the Islands; and reasoning from analogous conditions in Borneo, and the observed facts of the known occurrences of ore deposits associated with schists or crystalline massives, he so summarizes the previous observations.

From the slight amount of work already done it seems probable that the schists do



MANCAVAN COPPER MINE, SOUTHERLY ASPECT

TOPOGRAPHY ON GILONG CREEK



ABRA RIVER AT COMILLAS

not occupy as important a place as taken for granted by Mr. Becker, but that, as Abella generalizes, the diorites and dioritic rock in general are the oldest rocks, at least N. of the great plain of Luzon. As far N. as the Province of Abra, my observations have borne this out, and in this region, W. of the Cordillera Central, no schists have been observed.

From the W. coast of Luzon, particularly at Candon, the point on the coast at which the party disembarked, to the Cordillera Central, at the mass of Mount Data, the general relations of the rocks are as seen by a reference to the ideal section. The sedimentaries outcrop a mile or so E. of Candon, at that locality dipping 40° NW.; between Candon and Concepcion gentle folding has taken place, and the valley of the Balidbid River exposes recurrent anticlines and synclines, the region bearing a striking resemblance to the Potomac River valley and others of like type in the Piedmont area in Pennsylvania, Maryland, and Virginia.

At Concepcion, which is situated in a flanking valley at the foot of the W. slope of the range, the tilted sedimentaries are a prominent feature of the landscape. Great jagged blocks are tilted up against the main mass of this range, giving the slope a peculiar flat and geometrical effect.

At the crest of the Cordillera del Teila, as the coast range at this point is called, appears a great thickness of limestone, dipping to the southwest, and below it a heavy, thick conglomerate, cropping on the eastern scarp. The upper limestone, of a thickness of hundreds of feet, forms the crest of the range for an unknown distance; no fossils were collected during the hasty march, but in all probability search will reveal some organic remains; Santos quotes Semper as authority for the determination of nummulites from these beds, in abundance, and for the statement that the nummulites "have up to now occurred in the Eocene *(paleo thérico de M. Cordier)* or in the immediately adjacent Upper Cretaceous." Becker cautions the geological observer from inferring an upheaval from inclined stratification, but on account of the adjacent conglomerate and slates it is fairly certain that the tilting of the limestone may be traced to structural causes, and that the question of coral growth and pseudo-stratification does not enter here.

The basal conglomerate is also of great thickness, and, while on stratigraphical grounds it may not as yet be correlated accurately, it would appear from the continuity of these sedimentaries, observed from occasional peaks in going to the S. through Benguet, and on lithological grounds, that these are the extension of the *Agno beds* of Von Drasche. In the Agno River they are described by Von Drasche as consisting in the lower portions of coarse breccias and conglomerate of dioritic rocks, very coarsely bedded, with pebbles often of enormous size.

Regarding the ages of these rocks nothing can be said except the deductions already made by others. In the present work economic problems were of the first importance and these sedimentaries apparently have no specific connection with the ore deposits of Lepanto. Von Drasche first classed them as primitive, then Paleozoic. Later, Abella seems to have obtained fossils in the upper strata, of shells of surviving species, and lignite, and adopts the hypothesis that these Agno beds represent the basal conglomerate formed during the Miocene subsidence of the Philippine group.

Mr. Becker remarks in this connection that "it is tempting to seek in them (the Agno beds) the equivalent of Mr. Verbeek's breccia stage of the Eocene, which consist of unfossiliferous strata underlying Stage *a;* but the absence in the region of Benguet of the Cebuan lignitic series and the character of the organic remains appear to indicate that this portion of Luzon was above water during Eocene time." It may be possible that the tentative suggestion of this correlation may be later worked out, as it has happened that lately a small seam of lignite has been discovered on the Benguet road in this region. As it was not seen, its relations to the Agno beds are not known, and the coming field season in this area may throw some light on the subject.

The valley of the Abra River is cut, from these sedimentaries on the west to the Cordillera Central, in igneous rocks of various composition. With the exception of an olivine basalt (?) noted near Cervantes, no general lines were followed until the Mancayan district was reached.

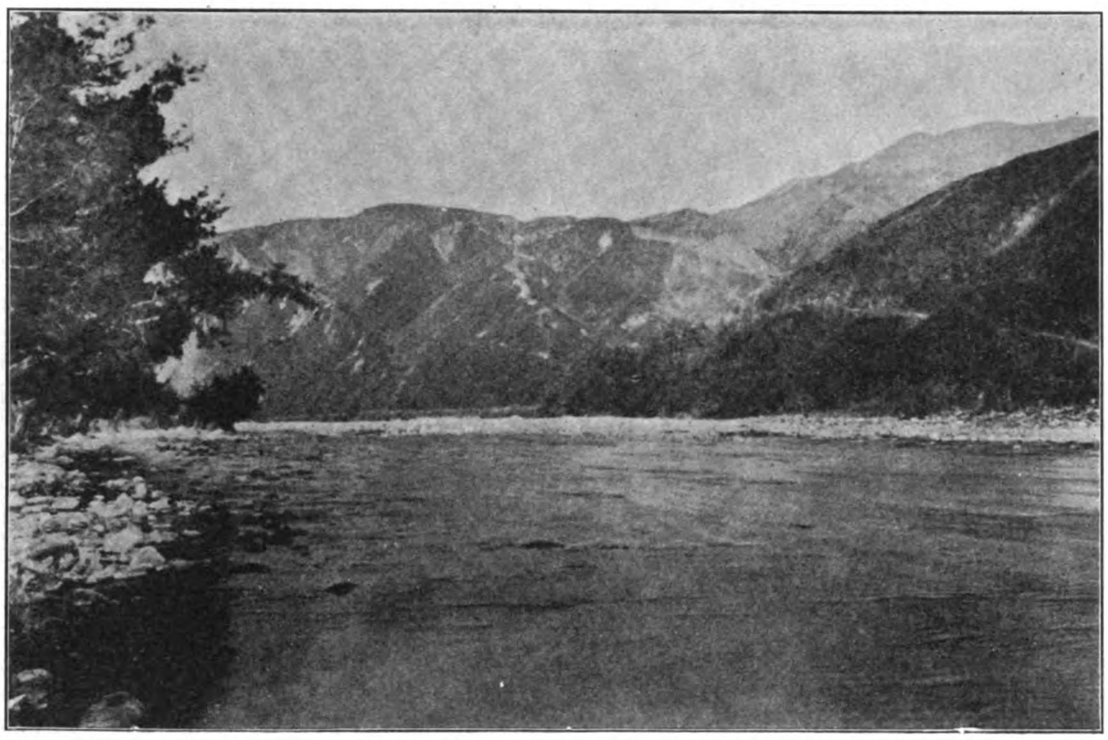
Here, after study of the area, the structure reveals an underlying diorite, the occurrence of which again confirms Abella's deductions.

Various igneous intrusions have taken place in the basal diorite, one of the most noteworthy having a considerable expanse immediately W. of Mancayan, the Mancayan River roughly following the contact between the two for a mile or more. This mass seems to have no relation to the economic aspect of the region, and, except for a description of the rock (called the Bagan granite, from its occurrence on the mountain of that name), will not be noted further. Other intrusions, and especially a mass at Suyoc, seem to have some bearing on the ore deposits and will be taken up. Except for the more important rocks of those having a direct bearing on the economic problem of this district, geological work on the rocks of this region will be reserved until suitable mapping may be done.

One of the most important masses, however, is the *trachyte* of Santos and von Drasche, which predominate to the E. of Mancayan. The basal diorite, named the *Mancayan* diorite from its best exposures in the river of that name, is overlain to a variable depth, by a crystalline, neovolcanic rock, classified, as stated, as sanidine-trachyte by Von Drasche, and by Santos expressed as *porfido arcilloso;* this Mr. Becker translates as argillaceous porphyry, and interprets as a quartzless, partially decomposed lava. This igneous rock outcrops on the W. side of the hill on which is situated the Town of Mancayan, and the contact follows a N.-S. approximation through Suyoc into Benguet. The same rock was observed at the town of Daklán, in Benguet, over 30 ms. S., and is evidently some extensive lava flow of late age. Facies of this occurrence were observed on the western slopes of Mount Data, and from the topography and structure of the region it is thought that the source of the outburst should lie to the E. Mount Data has been alluded to generally as an extinct volcano, and mention is made of a crater lake at its summit by Meyer. He states that he ascended Data (in 1882), measured its height by barometer as 2,245 meters, and found a lake 1,100 yds., in diameter on a bench on the eastern slope of the highest part of the mountain.

None of those who have given to the public notes this region have made mention of *sedimentaries* on the W. slope of Data. These clays and limestones were observed in a river cutting the base of Mount Data, dipping about 20° to the E. Over the upturned edges of these rocks, which have a section of some 500 or 600′ exposed by waterfalls, spreads the *trachyte* of Von Drasche, and the upper portion of the mountain is, a far as is known, of the same material.

Judging from the structure, therefore, it is at least open to doubt if the mass of Data, as generally supposed, is the remains of an extinct volcano, or whether Data is the residual mass left by erosion of the eastern limb of the broken anticlinical arch added to by later volcanic action, either intrusive or effusive



ABRA RIVER AT COMILLAS; EASTWARD VIEW

It is certain, however, that limestones and a small seam of coal do outcrop on the eastern flank of Data and that at Cayan, or its vicinity, E. of Cervantes, the limestone is again met with, these limestones containing numerous forminifera (nummulites), acording to Semper. If Data is of volcanic autogenesis, the activity was probably of a laccolithic type, intrusive, and not of the general mountain-building type prevalent generally in the Islands.

ROCKS.—The massive igneous rocks of this locality are represented by diorite, granite, quartz porphyry, trachyte, and one or more varieties of igneous intrusions that are not described. It is unfortunate that many rock analyses and determinations could not be obtained in time to be of service as data for this report, and also that in spite of every effort it was found impossible to prepare thin sections of one of the most important rocks in the district, the *trachyte* of Von Drasche. Due to the decomposed nature of this mass and the somewhat limited mechanical facilities at service, no satisfactory section of this rock is ready, and the additional lack of analyses prevents more than a megascopic description of it.

MANCAYAN DIORITE.—The diorite of this locality, the *Mancayan* diorite, is, on megascopic inspection, a dark-green granular rock, coming well under the field classificatory name of diorite. Within the Lepanto area it is uniform in texture and structure, showing unusually little of the variability of dioritic types. As noted before, the same type is noted in Benguet and other areas, and there are good grounds for believing that the diorite is a widely extended mass.

The relative size of the hornblende and feldspar give the rock its color, and in a hand specimen the amphibole is apparently predominant. On weathered surfaces, however, the feldspar stands out in light-colored lath or rod-shaped crystals, within a matrix of the amphibole. No other minerals are noted, megascopically.

In the examination of the thin sections there is revealed a plagioclase, in rod or lath shaped crystals, involved in a matrix of green hornblende. The plagioclase, as seen on symmetrically cut wins, is apparently labradorite, evidently of earlier formation than the hornblende. This reversal of the normal order of crystallization produces the pseudo-ophitic structure noted. The feldspar is white, cloudy, with dull, earthy luster; no zonary banding observed in the limited sections and no kaolinization to a great extent.

The next important mineral, the hornblende, occurs in flakes and very fragmentary masses surrounding the feldspar lathes; light green in the section and has a low extinction angle which can not be exactly determined, owing to the fragmentary nature of the mineral. No uralization was noted, though the transposition of gabbros or diabases to his diorite may not be positively denied.

No quartz present, nor mica. Olivine occurs in rounded grains in the hornblende, showing slight alteration. Magnetite also noted, in typical forms.

Four analyses of the Mancayan diorite follow:

	No. 1.	No. 2.	No. 3.	No. 4.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Moisture, 110° ...	0.50	0.28	0.38	0.12
Loss on ignition .	2.74	1.88	.70	2.26
SiO_2..............	50.67	51.	47 98	47.94
Al_2O_3.............	21.21	18.01	18.94	21.96
Fe_2O_3.............	11.31	.23	7 08	2.48
FeO................	.21	9.39	3.98	3.42
CaO................	6.86	8.80	11.01	12.63
MgO................	4.10	6 53	7.06	6 83
K_2O................	.10	·43	.44	.19
Na_2O...............	1 41	4 42	2.56	1.49
Total.......	99.11	100.51	100.13	99 35

Local variations may possibly explain variation in these analyses, in the instances of the lime and ferric-oxide content. The lime appears rather above the normal for this type of rock, as are the alumina and magnesia to a lesser degree. The remaining constituents appear about normal.

BAGAN GRANITE.—This intrusive mass, the contact of which with the Mancayan diorite is followed by the Mancayan River, west of the town of the same name, is a light-colored, medium and evenly grained rock, seen by megascopic inspection to consist of quartz, orthoclase, and hornblende. It is evidently holocrystalline, and typically granitoid in texture, coming under a *granite* in a field classification of phanerites. At its contact with the Mancayan diorite, sharp and clearly defined, from interfingering of the two masses, most of the places seen indicate that the granite is later than and intruded into the older diorite. Alteration or metamorphic action has taken place only to a very limited extent, and in many instances sharp angular *horses* of the diorite are included in the granite, near the contact, with no change whatever.

Under the microscope this rock is readily classified as a hornblende granite, showing quartz, feldspar, and hornblende only, in the slides examined.

The quartz is typical of similar occurrences elsewhere—xenomorphic colorless grains and masses, glassy in its pelucidity and clearness with numerous dust particles and gaseous inclusions.

Both soda and lime feldspars occur, with orthoclase predominant, in simple crystals, and numerous twins. Little of the feldspar is fresh, and it shows the typical decomposition structure, with well-marked cleavage planes and pearly luster.

The hornblende is also normal. Irregular masses, showing prismatic cleavage; the ordinary green variety is predominant, and occurrence of glaucophane (?) is noted. Other facies of the same rock give the more common brown of the hornblende, and in these some slightly more idiomorphic forms are noted.

Magnetite and possibly other iron minerals occur in abundant groups of crystals. There are also small inclusions, indeterminate, of a highly refractive mineral, which suggest possible titanite. Apatite occurs in small amounts.

Analyses of this rock follow:—

	No. 1	No. 2	No. 3
	Per cent.	*Per cent.*	*Per cent.*
Moisture...............	0.02	0.13	0.20
Loss on ignition......	.39	.84	1 01
Silica (SiO_2)...........	77.21	73.56	71.80
Alumina (Al_2O_3)......	15.38	1.42	2.46
Ferric oxide (Fe_2O_3)..	.72	1.27	1.93
Ferrous oxide (FeO)..	.93	14.30	14.28
Lime (CaO)...........	2.18	2.50	2.96
Magnesia (MgO)......	.42	.79	.22
Potassium oxide(K_2O)	.50	.38	1.54
Sodium oxide (Na_2O).	2.26	5.09	3.02
Total............	100.01	100.28	99.42

QUARTZ PORPHYRY.—This rock, the mass characterized by Santos as *porfido argilloso*, or argillaceous porphyry, as Becker translates it, occurs on the western side of the Mancayan hill, resting on the Mancayan diorite beneath. This one outcrop extends a distance of several miles, disappearing N. and south under the *trachyte* which covers it at Mancayan. There are to the N. several smaller outcrops, isolated masses or islands, and the whole mass has been the subject of considerable conjecture and limited study, having, as it does, a direct bearing on the ore deposits of the copper region.

Santos describes it as "a quartzose mass in a vertical position, not more than 80 or 100 meters in thickness which strikes NW., and is exposed at the SE. by a great cut, partly

FLOOD PLAIN OF ABRA RIVER AT COMILLAS

due to the mining operations of the natives. Toward the NW. it is partially concealed and disappears under argillaceous porphyry *(porfido argilloso)*, which is more recent. The siliceous mass is of the same character throughout its extent; it is sometimes compact, sometimes crystalline, often porous, and always charged with iron pyrite. It contains decomposed feldspar in irregular veins, or porphyritically disposed. The croppings are of columnar form. The whole mass is fissured or jointed in different directions." Mr. von Drasche later visited this locality, but could not discover the rock relations. He speaks of the rock as a rhyolitic quartz trachyte, which shows flow structure, with variations in the color of the ground mass from dark gray to red. In this thick, hard, splintery ground mass are quartz fragments, extremely numerous. They are never rounded nor do they show other than a regular character; they attain a thickness of 4 millimeters. Thin sections gave him no clue to the nature of the ground mass, but he states that it is evident that the quartz fragments have not come from the ground mass, and that they were *wrapped up* by the still fluid magma.

The two descriptions already given cover fairly well the general aspect of this rock—it is a hard, flinty, red to yellow-white quartz leucophyre with prominent quartz phenocrysts. Nothing can be made of this ground mass with the naked eye, and the study of the thin section reveals little but that it is extremely siliceous. The quartz seems to be perfectly clear and often perfect in crystalline form, and the doubly terminated hexahedron predominates. There is little or no superficial weathering of the rock mass, though the entire rock shows great alteration, and is without doubt a product of metamorphic processes. Under the microscope the porphyritic nature of the rock is more clearly visible—whole and fractured quartzes set in a quartz-feldspar paste from which little can be determined. Spaces of dissolution are a prominent feature of the rock, occasionally giving a cellular structure, and the presence of pyrite and magnetite is everywhere noteworthy.

From the few sections at hand, none of which proved to be entirely satisfactory, little positive information could be gathered. It does not appear, however, that Mr. Santos's conception of the mass can be regarded as correct; careful search was made for the columnar structure he noted, but beyond a series of cross fractures which form a noticeable characteristic of the exposure, it is certain that he must have been misled. Similarly, there is not the slightest hint of sedimentary origin in any of the exposures or thin sections examined.

Mr. von Drasche's necessarily hasty observations, leading to the view that this mass is a lens of quartz embedded in the trachyte, are not substantiated by a more careful study of the structure of the region, and hence this view is regarded as improbable.

All the evidence at hand points to a contact zone of limited extent, produced by the Mancayan diorite being covered by a considerable flow of the *trachyte*. Both microscopic and megascopic evidence show that the quartz porphyry is not original as such, and that but little of it, except the quartz, has existed unchanged since its formation.

Three analyses of the quartz porphyry are given below:—

	No. 1	No. 2	No. 3.
	Per cent.	*Per cent.*	*Per cent*
Moisture	0.22	0.11	0.00
Loss on ignition	1.24	2.70	3.18
Silica (SiO_2)	89.49	90.60	87.96
Alumina (Al_2O_3)	4.88	.07	3.75
Ferric oxide (Fe_2O_3)	4.24	3.15	3.83
Ferrous oxide (FeO)	.05	1.15	.69
Lime (CaO)	.04	.08	.08
Magnesia (MgO)	.32	.58	.23
Potassium oxide (K_2O)	.08	.16	.11
Sodium oxide (Na_2O)	.25	.70	.39
Total	100.81	99.30	100.28

TRACHYTE.—Covering all to the eastward of a line from Mancayan to Suyoc, and apparently over a much greater general area, is a rock which Von Drasche classifies as a hornblende-sanidine-quartz-trachyte, and from lack of other than megascopic inspection for a guide, that name, or more simply quartz-trachyte, expresses the rock as nearly as may be.

It is a much-decomposed granular-to-porphyritic mass, which weathers to varicolored clay, giving an appearance to the soil which may not be mistaken. In all the field work no absolutely fresh specimen could be obtained and those collected have altered in the laboratory.

There is present a noticeable amount of quartz in clear, rounded, fracture grains and prominently in doubly terminated hexahedrons; feldspar in short, tabular crystals, much decomposed; clear sanidines with typical luster and twinning; a ferro-magnesian mineral, indeterminate as to amphibole or pyroxene, in somewhat noteworthy amount; occasional biotite; considerable magnetite. The placing of the feldspars in the general mass gives the typical orthophyric structure, as opposed to the more common trachytic structure; the proportion of ground mass varies locally, but in all cases it is subordinate to the phenocrysts, approaching a pronounced granitoid texture in cases.

Below are given several analyses of the rock, made from imperfect field specimens. With no microscopic examination possible, and only the aid which the divergent and not representative analyses give, it appears that more exact determination may better be left to more detailed work in the Mancayan region. The name given by Von Drasche appears to be sufficiently definite for the purposes of this report and the rock will be so designated.

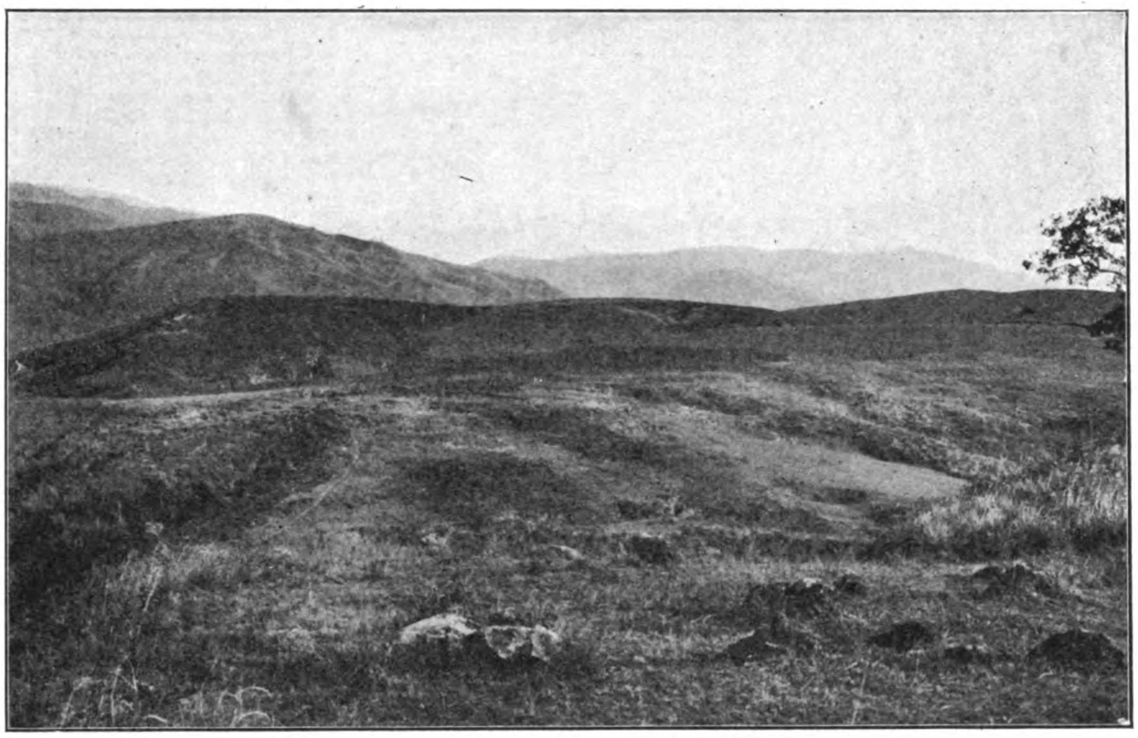
Analyses.

	No. 1	No. 2	No. 3
	Per cent.	*Per cent.*	*Per cent.*
Moisture	1.58	1.84	3.83
Loss on ignition	4.82	7.04	2.28
Silica (SiO_2)	54.80	68.31	60.48
Alumina (Al_2O_3)	19.29	18.18	18.11
Ferric oxide (Fe_2O_3)	1.83	2.15	3.14
Ferrous oxide (FeO)	2.54	.37	1.67
Lime (CaO)	8.21	.24	4.94
Magnesia (MgO)	3.11	.25	2.12
Potassium oxide (K_2O)	2.50	.98	1.38
Sodium oxide (Na_2O)	1.55	None.	2.40
Total	100.23	99 36	100.30

(To be continued.)

MINERALS OF BORNEO

Borneo is a country, says *The Mining Journal*, the size of which makes it worthy of consideration for prospecting operations, and when to its size there is added the mountainous and impenetrable character of much of the country, and the small European population, it is clear that much mineral wealth may still lie undiscovered. The island is divided between the Dutch, the Rajah of Sarawak, the Sultan of Brunei, and the British North Borneo Company, the three latter administrations comprising the British sphere of influence. The mining industry in the Dutch portion of the island is the most important, and some attempts have been made to study the general features of the geology of the country. It seems doubtful, however, whether apart from the prospects for the petroleum industry on the E. coast, the commercial prospects of mining are favorable. Details on the subject in this country are scanty. A detailed account of the gold mining industry in Borneo was given by Mr. S. J. Truscott



TOPOGRAPHY IN THE VICINITY OF CERVANTES

in a paper read before the Institution of Mining and Metallurgy some years ago. At that time three centers were mentioned:—Sambas, in West Borneo, not far distant from the district in Sarawak where gold mines are now being worked by the Borneo company; another in Central Borneo at the sources of the Kahajamg and Kapuas rivers; and the third about Martapoera in the SE. Gold mining in the Dutch Indies had a marked boom during the 90's, hundreds of companies being said to have been floated. In 1904, however, only three Borneo concerns appear as producers of any considerable quantity of metal—*viz.:* the Kahajan 126 kilos., the Sambas 47 kilos., and the Loemar 26 kilos. The Sambas District is said to contain a good deal of ground suitable for dredging, 2,749 tons of steam coal was mined in the Poeloe Nangka Concession, and 5,875 tons in Kotei, which also produced 131,810 tons of crude oil. Besides the mineral products worked, diamonds, platinum, quicksilver, iron, and tin have been found. The most prosperous operations at present carried on in the island appear to be those of the Borneo company at Bau and Bidi on the Upper Sarawak River. The output for 1904 was 41,290 fine ozs. The first named group of mines has been worked regularly since 1898, and has yielded to the end of 1903 87,182 ozs. of fine gold, averaging 3.88 dwts.; in 1904 the average had risen to 5.2 dwts.

The mines are in many ways interesting, and were recently visited by Mr. J. B. Scrivenor, geologist of the Federated Malay States, with a view to comparing the deposits and the conditions under which they are worked with those in Malaya, from whose report the following details as to these mines are derived. Operations hitherto appear to have been chiefly open cast, to the possibility of which and to the accessibility of good fuel is, no doubt, to be attributed the profitable working of the low grade of ore. So far the deposit appears to have been proved to a depth of 93' at Bau and 120' at Jambusan, where the breccia conveying the gold occurs in a fissure in limestone country. At Bidi the ore is of somewhat higher value, five samples quoted by Mr. Scrivenor, and stated to be above the average value, show a yield of 18 dwts., while at the Su San Shien mine at Bau the assay runs from 15 dwts. to 1½ ozs. The gold occurs in different formations, but it is derived, in Mr. Scrivenor's opinion, from igneous dykes, which where examined, were found to carry up to 1 dwt. The richer ores often carry a considerable amount of arsenic—as much as 14 per cent in some of the cases mentioned, while the Su San Shien ore is pyritic in character. The ground treated consists of loose soil, clay, mud, as well as lumps and blocks of the mineralised breccia from which the other materials have presumably been weathered. The breccia is broken in some cases from 2 to ½" size, which is apparently all the crushing necessary, and the whole product is then fed into the cyanide vats with a small quantity of lime. One of the most important features in connexion with these gold occurrences is that in most cases they show no visible gold; in fact, in many respects the deposits seem to resemble some of the occurrences described by Mr. Braddon in British Guiana. The ore worked at present has, according to Mr. Scrivenor, been largely affected by surface enrichment. At Tegora, in the same district, there is an old mine where cinnabar was worked by the Borneo Company for some years with good results. Occurrences of the following have been noted in Upper Sarawak: gold, silver, cinnabar, calomel, arsenic, antimony, lead, zinc, copper, manganese, pyrites, and diamond. Reference has been made to the gold mines being favorably situated as regards fuel. This is obtained from the government mines at Sadong, about 18 ms. up the Sadong River, whence it is carried some 20 ms. along the coast and then up the Sarawak River to the mines. The coal is ordinary black bituminous, burning well with little ash; it is, however, very smoky, and breaks up in firing, requiring special bars. The output is about 13,000 tons a year from a 2' 9" seam. Coal is also mined at Brooketon, chiefly for export to Singapore; it is, however, difficult to work, owing to its fiery character. Passing to the chartered territory there is little to note except coal mining. The British Borneo Syndicate, formed in 1902, were granted exclusive prospecting rights, but they do not appear to have met with success as yet. Manganese deposits are worked at Kudat, but their commercial value has not yet been definitely ascertained. Specimens of tin are said to have been discovered, but there is no information of any important find in this direction. Coal is, of course, worked in Labuan, and there are said to be important deposits at Cowie Harbor in the extreme SE. of the territory. As the chartered company imitates its better known exemplar in Rhodesia by requiring a large proportion of the shares of any company operating mines, it has, perhaps, saved disappointment that mineral deposits of commercial value have not yet been discovered. As regards Brunei, which is, we believe, still under the administration of the native sovereign, no information touching mineral resources seems to be available. The whole European population of Dutch Borneo does not appear to amount to more than 1,000, and the British portion is probably less. Thus it cannot be supposed that we have any extensive knowledge of its mineral resources. The Chinese workings afford, of course, the chief prospecting data, and as has been proved in the case of Sarawak, their mining knowledge is too primitive for their work to be regarded as at all exhaustive in character. Physically speaking, the country is well supplied with waterways, and, of course, unlimited labor is available from China, and though as a whole successful mining undertakings seem scarce, the handsome profits made by the Borneo company may well attract attention to that district.

JAPAN'S RAILROAD EXPENDITURES

On the Seoul-Wiju Railway there has been already expended -Y-21,841,243, in which total is included the cost incurred in carrying to rapid completion the railway between Samlang-jin and Masan. To be still expended upon the Seoul-Wiju line in order to perfect it and bring it into the condition of a permanent road, Y20,040,900. Out of this last total, orders for essential materials have been given and labor has been undertaken to the extent of -Y-4,340,000.

On the Nasau-Samlang-Jin road the sum already spent, in addition to the money appropriated from the Seoul-Wiju fund, is -Y-1,191,356; on the East-Chinese Railway the sum already spent is -Y-29,174.910; the sum required to complete the work will be -Y-3,380,239. On the Antung-Mukden Railway the sum already spent is -Y-6,209,365. The sum required to complete the work is not yet definitely ascertained.

Adding up the above figures, it results that the amount actually defrayed out of the war funds for purposes of railway building is -Y-58,416,874, and that the amount still to be spent, so far as has been ascertained, is -Y-23,420,239. Probably the latter figure will ultimately reach a total of -Y-40-000,000 and the grand aggregate of expenditure will be -Y-100,000,000, approximately. There

can be no question about the very solid interests secured by this Empire in Korea and Manchuria. Another point emphasized by the figures is that when Japan asked the Peking Government for the concession of the Antung-Mukden road she had already invested in the enterprise a very substantial sum, and the same was true on a much larger scale with regard to the Liaching-Chanchung line. The same argument did not apply at all to the Kirin-Chanchung road, and probably applied in only a very insignificant measure to the Hsinmintun-Mukden line, which had been constructed by the Russians.

KEROSENE OIL AND LUMBER IN MANCHURIA

In kerosene oil the American product has had almost a monopoly in the Manchurian market during the last 16 mos. At one time Russian oil threatened serious interference during Russian occupation of Newchwang, and at the present time the Germans, who are handling the Sumatra oil, claim to have brought to this market during the past season 439,030 galls., valued at $11,325 gold. The Standard Oil Company imports during 1905 were, approximately, 2,482,700 galls., the custom house valuation being $326,874 gold, which is very low, as will be seen by computing the relative value per gallon on the basis of the total estimated valuation. Of this quantity 1,130,710 galls. came in direct from the Atlantic seaboard. The balance was transhipped either by the Chinese or the Standard Oil Company *via* Shanghai. The Sumatra oil-producers are eager to establish a permanent business in Manchuria, and contemplate the construction of storage tanks, etc. The Standard Oil Company is anxious to provide adequate accommodations for its extensive and growing business, and is ready, just as soon as a suitable site can be secured, to build extensive storage facilities. Work on these new buildings will be begun this season.

During February, 1906, there developed a tendency on the part of the Sumatra oil promoters to cut prices. This may be found necessary to secure ready sales, inasmuch as the Sumatra product has a reputation among the natives for smoking and not being as desirable as the Standard Oil product. The oil imports for 1905 should be considered, however, in connection with the fact that between 2,800,000 and 3,000,000 galls. were carried over by the Standard Oil Company from 1904 to 1905. Again, 1,800,000 galls. were carried by the same company from 1905 to 1906. This is alleged to be mainly due to interferences to inland transportation facilities resulting from the Russo-Japanese war.

AMERICAN LUMBER IN DEMAND.—In lumber the United States was more prominently represented at Newchwang in 1905 than ever before. A considerable quantity came direct from the North Pacific Coast—Puget Sound and the Columbia River—and of a total importation of $558,429 for the season, $191,888 is credited to America. Japanese shippers brought in large quantities of poles, short timbers, and light-weight boards. The Chinese also contributed to the imports. In all instances, however, the American lumber was found to be the best, and further importation will follow. While there are valuable timber areas in the Yalu River section of Manchuria, the indications are that for the present there will continue to be a growing demand for American lumber in Manchuria. With the introduction of modern sawmill plants in suitable sections of the Far East this demand may be supplied by the oriental product. All long pieces of lumber come from America. With the exception of a small amount of lumber manufactured at Shanghai—that is, a small amount as compared with the output of North Pacific Coast mills—the lumber of merchantable lengths and sizes reaching this market come from the Pacific Coast. Locally, logs are whipsawed by hand, and tongue and groove flooring is unknown. A fair quantity of American flooring was imported here in 1905, and gave the best of satisfaction. Sash, doors, and blinds are mostly made by hand during the construction of buildings, but in some instances all of these are imported from Shanghai, where they are manufactured by modern machinery. There are no wooden houses or buildings in Newchwang, and few in Manchuria. The bricks are of inferior quality, the price ranging from $8 to $11 per thousand.

DEATH OF MR. BEVIS

"We much regret," says *The London and China Gazette*, of May 11th, "to report the death of Mr. Herbert Maurice Bevis, an old and very well known manager of the Hongkong and Shanghai Banking Corporation. It will be remembered that Mr. Bevis suffered from a severe illness in Hongkong about 18 mos. ago and that on his recovery he proceeded home on leave. His death now at the age of 52 was, we regret to say, due to his own action. He had been depressed lately, and on the morning of 4th inst. he left his residence in Ashley-gardens, Victoria-st., and went to his club at 86, St. James's st., where he ordered a bath. Before going to the bath room he asked the hall porter to send a boy on an errand. When the reply came no answer could be got from the room and the door had to be forced. At the inquiry which had naturally to be held, Mr. J. Howard Gwyther identified the deceased as his brother-in-law, whom he last saw alive a fortnight ago, when he was not at all well. Apart from his health there was no trouble of any kind. He had been given to understand that he felt no longer fit for active occupation, which he thought had become so intolerable that it affected his mental condition. Sir Francis Laking, who was called to the club, stated that the deceased had, while sitting in a warm bath, cut his throat with a new razor and was quite dead. There was a fully-charged revolver in the room, but none of the cartridges had been discharged. Dr. William Hartigan said he had known Mr. Bevis for a number of years. His whole nature had quite changed when he returned from China, doubtless due to his illness. On April 2d he consulted witness about going abroad again, and witness told him that he was unfit to go. The climate of China affected one mentally, and when a man broke down in health the previous effects of living there would come out very strongly. Such being the medical evidence the cause was attributed to temporary insanity. The following letter was found in Mr. Bevis's coat, hanging on the wall:—'74, Ashley-gardens, S. W. My Dear Gracie,—What I am going to do is best for you. I made a wrong return in my income tax. I must have been mad, and suppose I am now. I told the bank to put the £5,000 Japanese Loan in your name, so you will have something to go on with. I hope the bank will treat you well as the wife of an old servant, for we have very little money left. Farewell to you both. I am truly sorry. —Yours truly.' (The letter was not signed.) There was also a letter to the bank with regard to the £5,000. Mr. Bevis had been for some 30 yrs. on the staff of the Hongkong and Shanghai Bank, and was well known throughout China and Japan, where his death will be regretted by many friends. He was last manager of the Shanghai branch. The funeral took place at the Brompton Cemetery on 9th, amongst the mourners present being the Rev. Henry Bevis (brother), Mr. J. Howard Gwyther (brother-in-law), Mr. Leslie H. Gwyther, Mr. Ernest Miller, and Mr. Noel Pike (nephews), Sir Thomas Jackson, Sir Ewen Cameron, and Mr. C. S. Addis (representing the Hongkong and Shanghai Bank), Mr. H. R. Coombs, Mr. A. P. Stokes, and Mr. Horace Harwood."

JAPAN'S MARVELOUS GROWTH

The French vice-consul at Hongkong has been watching Japan's increasing influence in the Far East, and in a report to his government on the subject, he says:—

"At Hongkong alone the Japanese import three quarters of the coal arriving there. Japanese boats become more and more the carriers of copper. Till lately shipments of sugar from Hongkong to Japan were important. They have fallen from 33,000,000 to 3,000,000 kilograms, and Taiwan now produces enormous quantities of sugar for Japan."

The consul has found that it "is impossible to obtain from the interested parties any particulars on the methods of the Japanese merchants. Discretion with them is a rigid rule. The Japanese deal among themselves or with the Chinese from year to year, and accounts are squared once in the 12 mos., whereas with the Europeans business is done at from 3 to 6 mos. The rise of the Japanese commercial fleet has been phenomenal, and it now occupies the second position in the Chinese ports amongst the foreign flags. The tonnage of Japanese vessels entered at Hongkong has quite doubled since 1898."

What strikes the consul as most remarkable is the rise of commercial navigation in Japan, which has been at the expense of the British companies. It is said that Japan will no doubt establish in due course a Monroe Doctrine of her own in the waters of the Far East.

MACHINERY FOR JAPAN

Various new companies and extensions, involving a large outlay of capital, are about to be launched in Japan, and the following figures are of interest:—Capital required for companies being promoted to supply water power for electric-motor power, estimated at $35,700,000 gold; for new electric light and railway companies and for extension purposes, $9,825,000 gold, of which $3,850,000 will be supplied from abroad; for extension of spinning mills, $16,275,000 gold. Municipal enterprises in many cities involve an outlay of $12,610,000 gold. New mining companies are also being floated. Their aggregate capital amounts to $17,600,000 gold, of which $8,850,000 is to be raised by foreign loans. New railway and shipbuilding enterprises represent the sum of $25,092,000 gold.

The imports of machinery at Kobé amounted in 1905 to $5,148,000 gold, or over three times the value imported in 1904. Of all machines lathes made the highest increase, amounting to $1,240,000 gold. Next follow machines for metal and woodwork, spinning, and electric-light plant, locomotives and electric motors. Each of these various lines showed an increase of over $250,000 gold on the figures for 1904.

Imports continue to increase, and the value of machinery imported during January last amounted to $515,800 gold against $330,600 for January last year. Almost every steamer arriving in Kobé from Europe has had consignments of machinery on board.

NEW FLOUR MILLS IN JAPAN

Agents for American flouring mill machinery manufacturers have recently sold complete outfits for four flour mills to be erected in Japan. Two of these mills have a capacity of 200 bbls. each per day, and are to be erected in Tokio. The other two are 60-bbl. mills, and one is to be constructed at Nagoya. Contracts for these mills have evidently been let on the belief that the new tariff bill increasing the duty on flour will become a law.

JAPANESE HARDWOOD PURCHASES

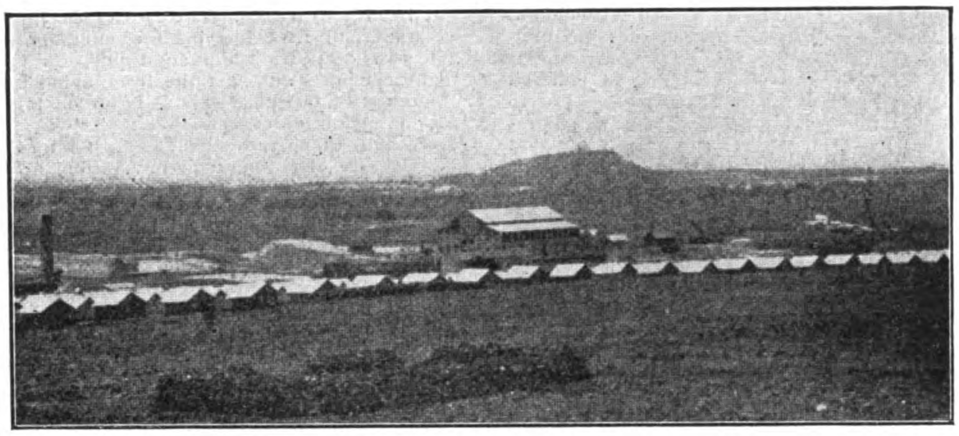
The Japanese importations of teak wood from Siam and Dutch India were, for 1905, $368,466 gold, against $73,445 in 1904, most of which was entered at Kobé. This gives an idea of the growing demands for hard woods for vessels, buildings, and the manufacture of furniture. Teak logs arrive in 17′ to 45′ lengths. Teak planks of 15′ to 25′ in length are 8″ wide, 4″ thick, and up, smallest size, while the 20′ or more lengths are 12″ to 20″ wide and 2¼″ to 6″ thick, those 30′ long running as high as 7½″ thick. They are required to be without worm holes or cracks. Teak deck planks must, likewise, be sound, and run from 20′ to 30′ long, 5 to 5⅛″×2½ to 3⅝″.

LARGEST HYDROELECTRIC INSTALLATION IN SOUTHERN ASIA, MYSORE PROVINCE, INDIA—IV

(By A. C. HOBBLE)

There are 15 main feeder circuits from the low-tension (2,300-volt) bus-bars and extending in several directions over the Mysore gold fields from the low-tension distributing tower, which is located on the opposite side of the building from the transmission line entrance towers. The maximum length of distribution circuits from one end of the gold fields to the other is about 5 ms. Altogether there are some 15 ms. of feeder circuits. Each feeder circuit is equipped with lightning arresters at the outgoing end, while at the motors both lightning arresters and fuses are provided. Each main feed circuit is protected by an automatic relay which instantly trips the 2,300-volt oil-switch in case of very heavy overloads or short-circuits. In the new construction these relays are conveniently located on the front of the feeder panels of the main switchboard.

TROUBLE IN TRANSFORMER STATIONS.—Some trouble has been experienced in both transformer stations with static discharges or leakage from high-tension rubber-insulated conductors where they came into loose contact with porcelain or other insulating bushings. Rubber, even of the best quality, deteriorates more rapidly in this and in other tropical climates. Owing to the prohibitive price of pure Para or india-rubber, inferior grades are often used for the insulation of electrical conductors. Most of the inferior grades of rubber contain more or less sulphur. It is now well known that pure rubber deteriorates more rapidly through oxidation than vulcanized rubber. Owing to this fact it is of the highest importance that all rubber-insulated conductors (especially high-tension conductors) should be thoroughly tinned to prevent the oxidation of the copper from affecting the rubber insulation. It has also been found from experience that static discharges from high-tension rubber-insulated wires and cables bring about a rapid deterioration of the rubber (if the latter contain sulphur) through the formation of sulphuric acid which eats away the insulation. Owing to the static discharges it is also possible for nitric acid to be present.



MYSORE GOLD MINING COMPANY'S DISTRICT, SHOWING STAMP MILLS AND LINE OF COOLIE HUTS

Hence it is very important that the prospective purchaser of rubber-insulated electrical conductors should specify the quality of the insulation and the tests which the same must withstand, not omitting that the copper conductor must be thoroughly tinned. The cheapest reliable form of rubber-insulated wire or cable is that in which the tinned conductor is surrounded by a pure rubber layer, outside of which is the vulcanized rubber. The pure rubber layer prevents the sulphur from attacking the conductor. High-tension wires and cables insulated with many layers of good quality varnished cambric have given excellent satisfaction and are much preferred to rubber insulation for high-tension work, especially in the tropics.

It has been observed that in those cases in which the rubber-insulated cable passes through porcelain bushings, the static discharge is accentuated and the rubber deteriorates rapidly. This trouble has been successfully overcome where the cable passes through vertical bushings by filling the latter with good quality insulating compound. This is not easily done where the cables pass through horizontal bushings. The remedy in this case is not to use any bushing whatever, but to have plenty of air insulation with rigid insulating supports. In case porcelain or other bushings are used, they should be of sufficient inside diameter to allow of ample clearance for the insulated conductor. This may be effected by using rigid insulating supports for the cable on either side of the insulating bushing.

Judging from experience it is not advisable to use glass insulators for high-tension currents above 20,000 volts, when such insulators are exposed to slight jars or shocks, such as are liable to occur when they are used as supports for disconnecting switches. Glass insulators used for this purpose are very apt to develop cracks or flaws. Such defects prove a high-resistance path to ground and it is only a question of time when the insulation gives away entirely. Glass for high-tension work must be perfectly sound and of good quality. Porcelain has been found much superior as regards mechanical strength, and if of a good quality is a highly satisfactory insulating material.

The iron casing of high-tension transformers, when such are located in isolated places, should not be grounded. Such grounds only increase the liability of a breakdown when abnormal pressures occur, as occasionally happens.

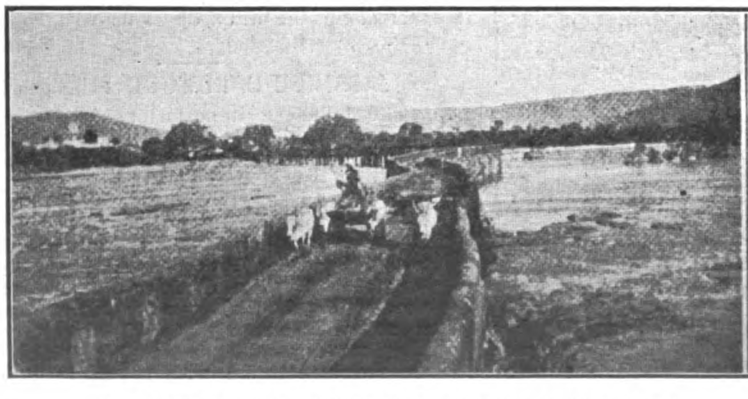
POWER AT THE MINES.—Champion Reef and Mysore mines, which together consume 3,500 h. p. from the Cauvery plant, have their own substation or center of distribution. In this way they have control of their own individual feeders. In this substation is located the necessary switchboard and switching apparatus for the control of 12 feeder circuits.

Besides the General Electric Company's motors there are to be found several Westinghouse, Sandycroft, Peebles and British Thomson-Houston companies' motors.

That the value of electricity in mines is realized and appreciated by the Kolar gold fields mining companies is apparent by the ever-increasing demand for electric power. Motors have been installed for driving air-compressors, pumps, and stamp mills, and it is to be hoped that the near future will see them installed in a larger unit for hoisting purposes. The electric hoist has reached a stage in which it compares most favorably with other systems, and in most cases is much to be preferred.

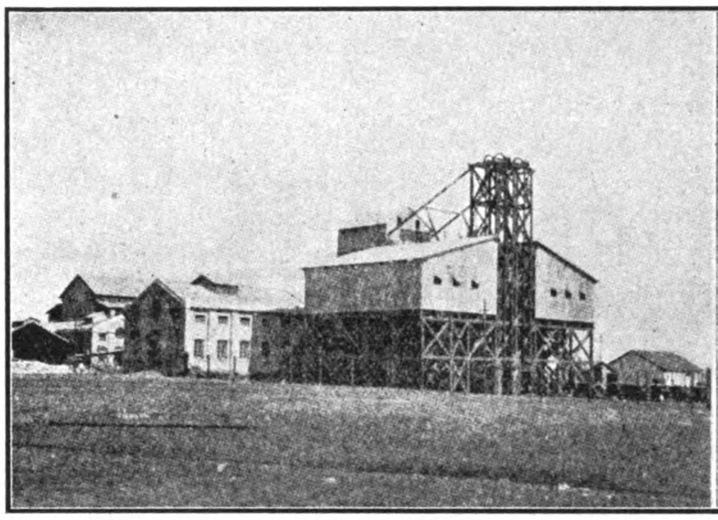
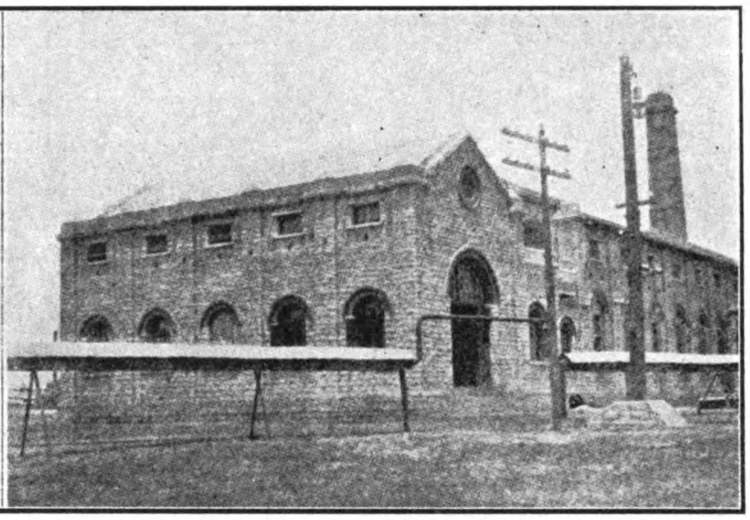
The advent of the Cauvery power installation has been the means of supplying much cheaper power, a more constant service, and a decided saving in many other respects to the mines. The grades of coal mines in India are of low calorific value, not averaging more than 65 or 70 per cent. Thus with the price of coal at $6 per ton, steam is an expensive article for motive power. The present cost of electric power delivered to the gold mines by the Cauvery power scheme is £18 (less than $90) per h. p.—year. In 3 yrs. this rating will be reduced to £10 (less than $50) per h. p.—year. This will mean an enormous saving to the mines in cost of power, since great economy is effected at £18 per h. p.—year.

Owing to the increased demand for electric power at the mines, a third transmission line may ultimately be constructed from Sivasamudram to Kolar to supply at least



HISTORIC BRIDGE ACROSS THE CAUVERY RIVER, NEAR SIVASAMUDRAM

NATIVE STREET IN BANGALORE TO BE SUPPLIED WITH ELECTRIC LIGHTS

MOTOR-OPERATED ROCK-CHUSHER AND COMPRESSOR HOUSE CONTAINING 900-H. P. MOTOR-DRIVEN WALKER AIR COMPRESSOR, CHAMPION REEF GOLD MINE, KOLAR GOLD FIELDS

an additional 2,000 h. p. For this purpose an extra 2,000-kw. unit will be installed in the present generating station at Sivasamudram.

It is probable that a 6-m. line will be constructed from the Kolar transformer station to Betmangala, where is located a 450-h. p. pumping station, which is the main source of water supply for the Kolar gold fields. The three 150-h. p. Worthington pumps are at present steam-driven.

A 1,000-h. p. steam plant has recently been built, and put into operation, for the supply of light and a small amount of power to the gold mines. The equipment consists of four 250-h. p. Allen condensing engines direct-connected to a 175-kw. British Westinghouse generator. Two of the steam-driven sets consist of two generators, one of 50 cycles for lights and one of 25 cycles for power, mounted on the same shaft with a 250-h. p. Allen engine.

The steam plant is quite up-to-date, embodying two batteries each of two Babcock & Wilcox 300-h. p. water-tube boilers equipped with feed-water heaters, a Green economizer, chemical softener and superheaters. Forced chimney draft is used to secure complete combustion. A cooling tower equipped with motor-driven cooling fans is located near the station.

All outgoing feeders are led underground from the switchboard about 100′ distant where is located a distribution tower (see illustration) from which they are carried in four directions over the gold fields.

BANGALORE LIGHT AND POWER DISTRIBUTION.—Distribution of light and power for the City of Bangalore is to be effected from one main transformer station and two smaller substations located near their respective centers of distribution. The two additional substations are necessary owing to the extent of territory to be lighted.

The transmission line voltage is stepped down from approximately 31,500 volts, as received after 10 per cent loss in transmission, to 2,300 volts by means of six 150-kw., 25 cycle General Electric oil-cooled transformers; 2,300-volt feeder mains are run from the main transformer station to the other two substations.

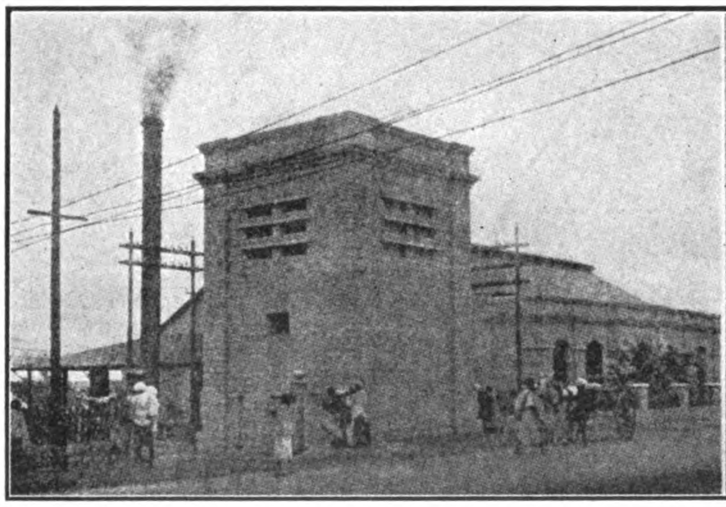
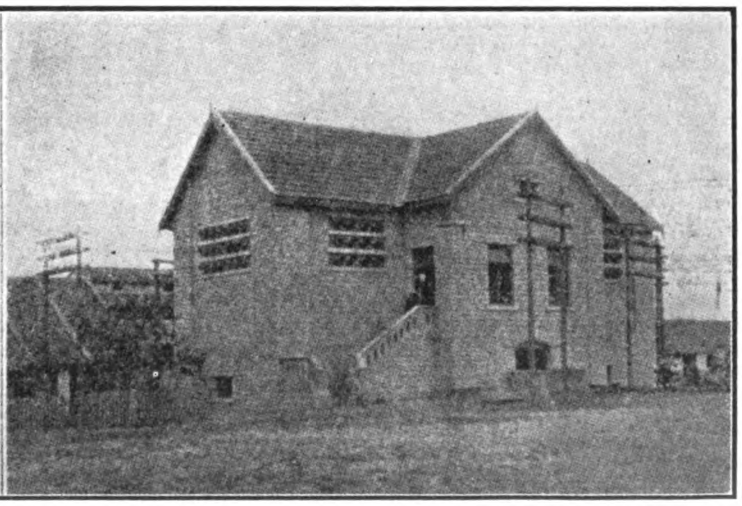
In each of the substations there will be installed constant-current transformers with a primary voltage 2,200 and a secondary voltage at full load of 3,000. Each tranformer has a capacity of 17.5 kws., or approximately 104 40-candle-power series incandescent street lamps. The latter are placed on iron poles with goose-neck fixtures. The spacing is 300′ between lamps in all of the principal streets, with a gradual increased spacing towards the outskirts of the city. Also in each substation there will be installed a 110-h. p., 75-kw., 720-r. p. m. motor-generator set, or frequency changer, in addition to necessary feed regulators, panels, switches, meters and fuses for general interior lighting and for power distribution. A frequency of 25 cycles is used for the street lighting and power circuits, while 60 cycles are obtained by the frequency changers for interior lighting. The distribution for interior lighting is effected by 2,200-volt feeders radiating to local centers, where are installed lighting transformers for a 3-wire distribution at 440/220 volts. A 2,200-volt feeder leads to the center of power distribution, where the voltage is lowered by transformers to 230 volts for the operation of 3-phase induction motors.

About 500 h. p. will be consumed by the Bangalore cotton and woolen mills and it is expected that at the least 500 h. p. will be consumed for lighting at the start. The lighting load is expected to increase to a great extent. With the day load of motors and the night lighting load somewhat equally divided, a high load-factor should result.

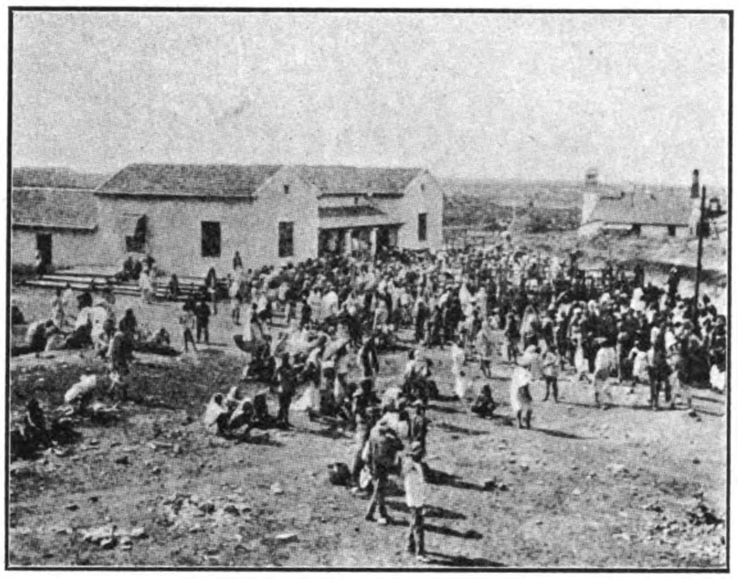
MANY DIFFICULTIES ENCOUNTERED.—Many difficulties are encountered in installing a lighting system in a city like Bangalore, where the local centers of distribution are so far apart. The carrying out of the plans for the street lighting circuits has been very difficult, especially in the native quarters and bazârs, where the streets are narrow and crooked and the houses are staggered in such a manner as to make the construction of pole lines very difficult.

The low rates charged for lighting afford Bangalore cheaper electric illumination than will be found in the majority of English, Continental, and American cities, and it is evident that the residents intend to take advantage of this opportunity. Owing to the grade of material installed and attendant inspection by competent and experienced electricians, the fire risk is practically *nil* as compared with oil lamps, and fire insurance rates should be lessened. The entire cost of installation of light and power in the city is estimated at 6 lakhs (£40,000) of rupees.

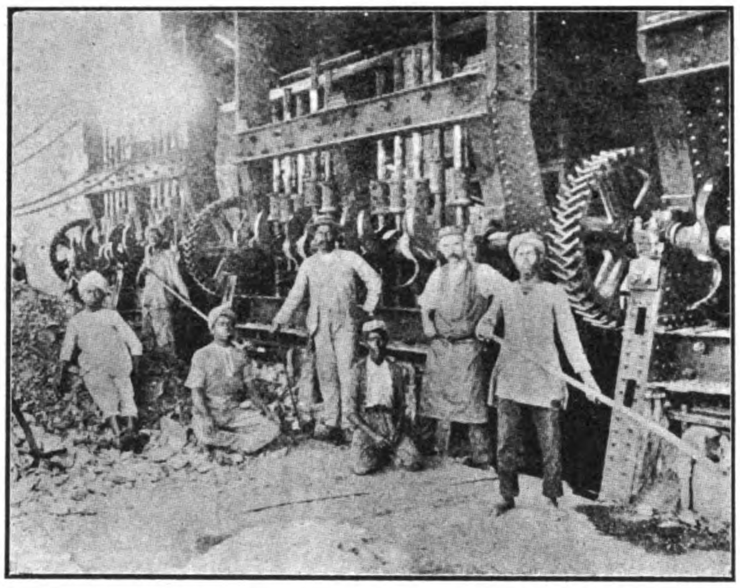
Owing to the fact that it has been found necessary to obtain special sanction, under the Indian Electricity Act, from the Government of India, for the supply of light and power to that section of the Bangalore

STEAM-POWER STATION, SHOWING ALSO THE DISTRIBUTION TOWER, AND THE CHAMPION REEF AND MYSORE SUBSTATION, KOLAR GOLD FIELDS



PAY DAY AT ONE OF THE MANY MINES, KOLAR GOLD FIELDS



OOREGAUM OLD STAMP MILLS; THESE HAVE BEEN REPLACED BY A MODERN STAMP MILL

Municipality known as the cantonment, the plans as briefly outlined above have had to undergo many changes. This has necessitated much delay and additional first cost to the Mysore Government of the installation as a whole.

As the two smaller substations, for supplying light and power, are located within the precincts of the military station, or cantonment, it has been necessary to make arrangements for the time being to supply the city proper from the main step-down transformer station, thus overcrowding it to a considerable extent. It seems obvious that some provision might have been made by those in authority, whereby such unnecessary delay and increased outlay might have been avoided, and the cost of illumination maintained at the original unusual low rate.

It is highly probable that the City of Mysore, the seat of government of Mysore State, will be supplied with light and power over a separate 40-m. transmission line from Sivasamudram during the current year.

Owing to the rapid development and expansion of electrical projects in Mysore State it has been necessary to establish an electrical branch of the Public Works Department, with the head office of the same at Bangalore. Mr. H. P. Gibbs has held for the past 3 yrs. the office of chief electrical engineer to the Government of Mysore. To Mr. Gibbs and other engineers on the staff of the Cauvery power scheme, the writer is indebted for many valuable suggestions and much valuable assistance pertaining to data regarding the scheme.

MYSORE'S PROUD DISTINCTION.—The State of Mysore has the proud distinction of having, in the development of the Cauvery Falls power scheme, paved the way for future progress of like projects in other provinces of India. Chief among those whose efforts made possible the ultimate success of the Cauvery project were Major A. J. de Lotbiniere, R. E., deputy chief engineer to the Government of Mysore, and Sir K. Sheshadri Iyer, the late Dewan of Mysore, whose death before the completion of the work is to be deeply regretted.

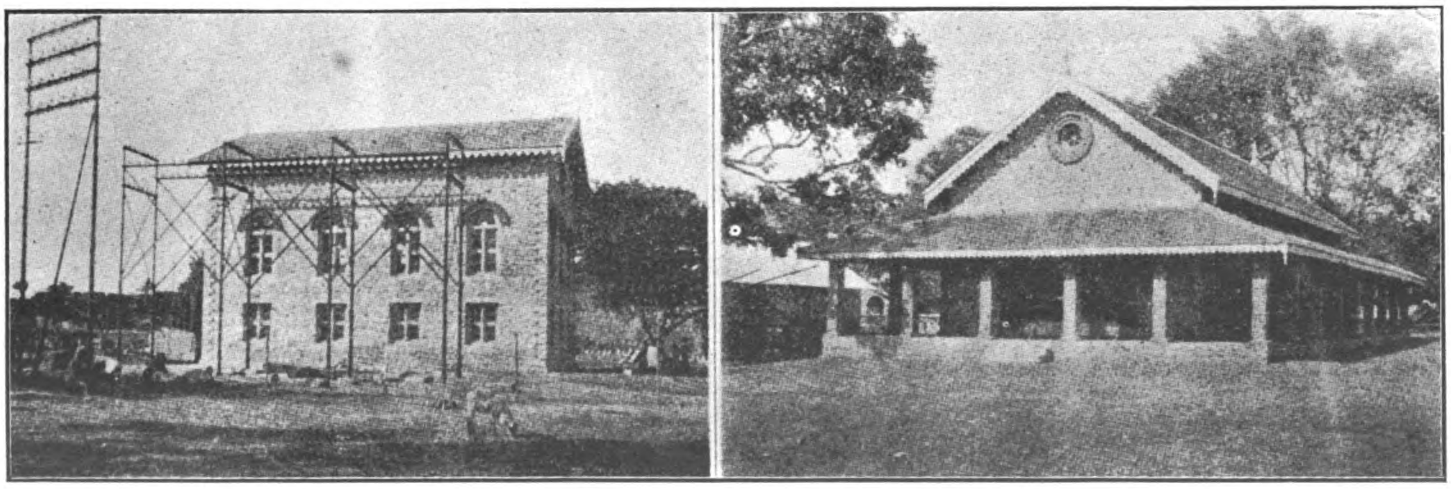
Since the completion of the Cauvery power scheme, electric development in many respects has shown a marked progress all over India. Several hydro-electric projects are in a fair way to be realized in the near future. At the present the most important piece of electrical engineering work for which plans are being prepared is the Kashmir or Jhelum River power scheme in N. India. This will, in all probability, include a 15,000-h. p. installation for light and power, a large electric dredging system and a 200-m., single-phase electric railway. Several large cities are already installing or preparing to install municipal lighting plants.

Several parts of India are rich in iron, aluminum, and other mineral deposits, but owing to the high price of fuel and transportation difficulties these deposits remain undeveloped. The location of a water power within economical transmission distance affords the only available means of making these deposits a paying mining investment. Thus it is highly probable that the electric furnace may play an important part in the development of the steel and aluminum industries in India.

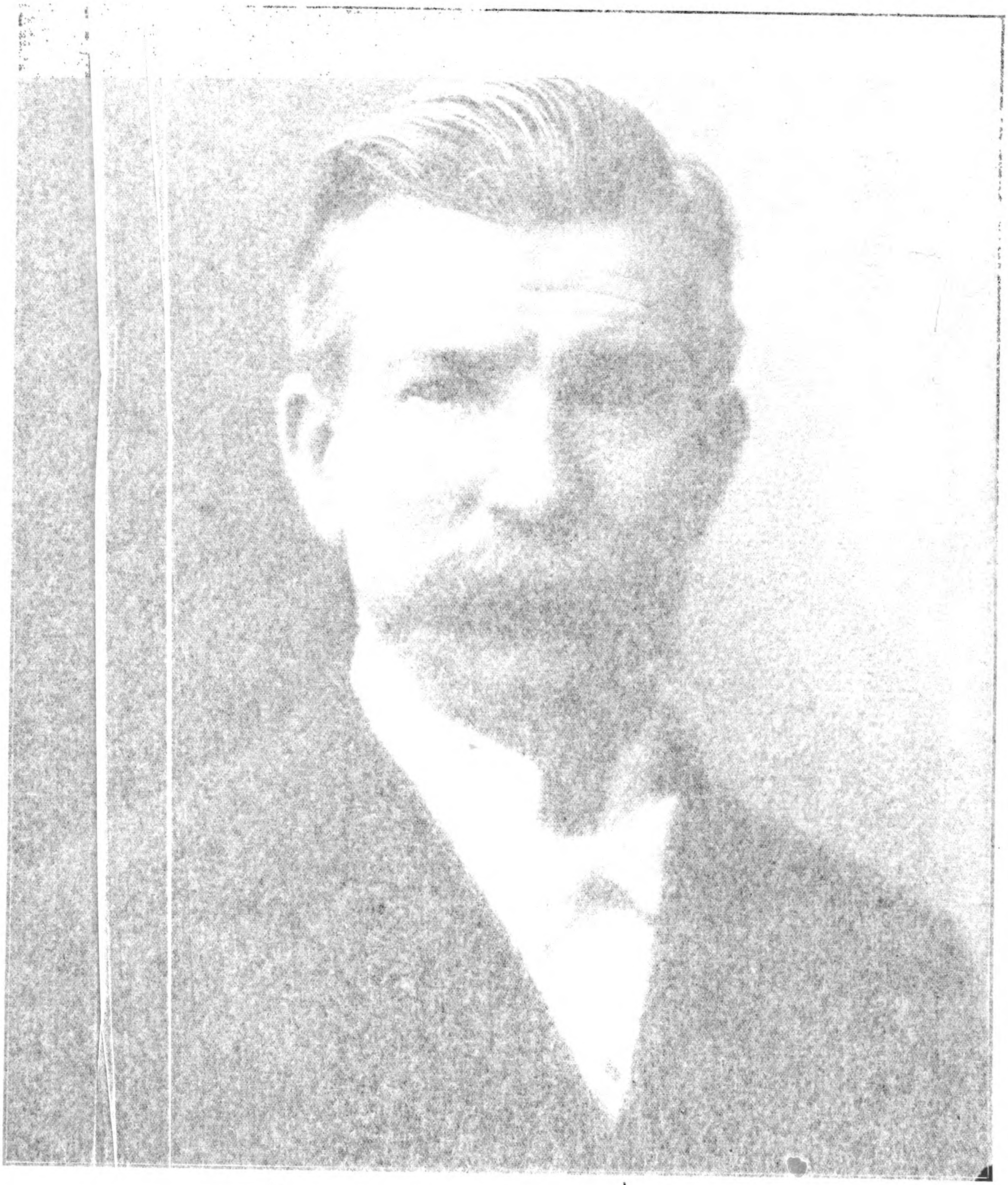
(Concluded)

JAPAN'S GROWING TRADE

Despite the serious interference caused by the war, the foreign trade of Japan for the year 1905 reached an unprecedented volume, the total amounting to over $400,000,000 against only $345,000,000 for the previous year, while a comparison made with 10 yrs. back shows that the trade has nearly trebled during the decade, the growth having been quite startling in its rapidity. The *Anglo-Japanese-Gazette* says that each year indicates that Japan's future lies in her manufactures. The results of the past two years were attained in the face of almost overwhelming difficulties, nearly 1,000,000 of able-bodied men being absent on the battlefield, and yet, in spite of this, and the fact that the people of Japan had to furnish supplies for the army and navy, they were able to send larger quantities of manufactured goods abroad. The exports kept up their rate of steady progression, although naturally enough, when compared with the imports, this development appeared to be comparatively trifling. Now that peace has been established on a solid footing, it is reasonable to expect a further expansion of Japan's foreign trade, although the shortage



DISTRIBUTION SIDE OF MAIN TRANSFORMER STATION, AND OFFICE OF THE CHIEF ELECTRICAL ENGINEER TO THE MYSORE GOVERNMENT, AT BANGALORE



His Exc[illegible] [illegible] E. Wright

First [illegible] Ambassador Extraordinary and [illegible] Court of His Imperial Japanese Majesty at Tokyo

June, 1906

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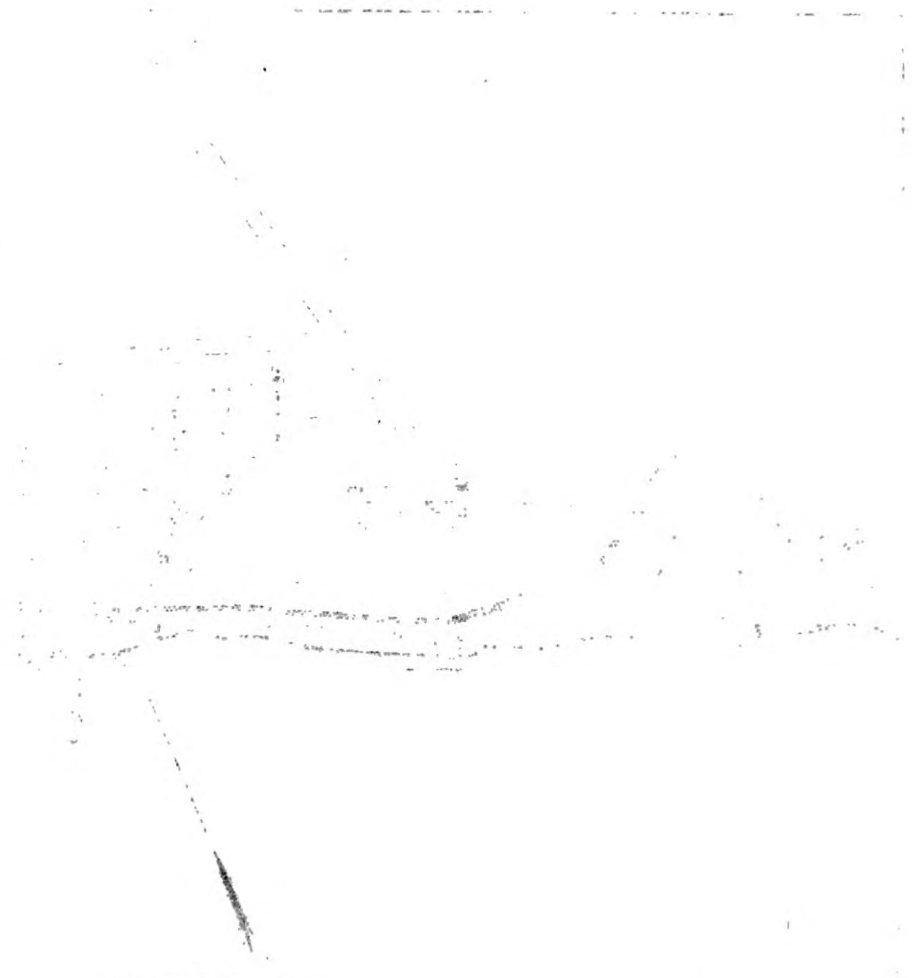

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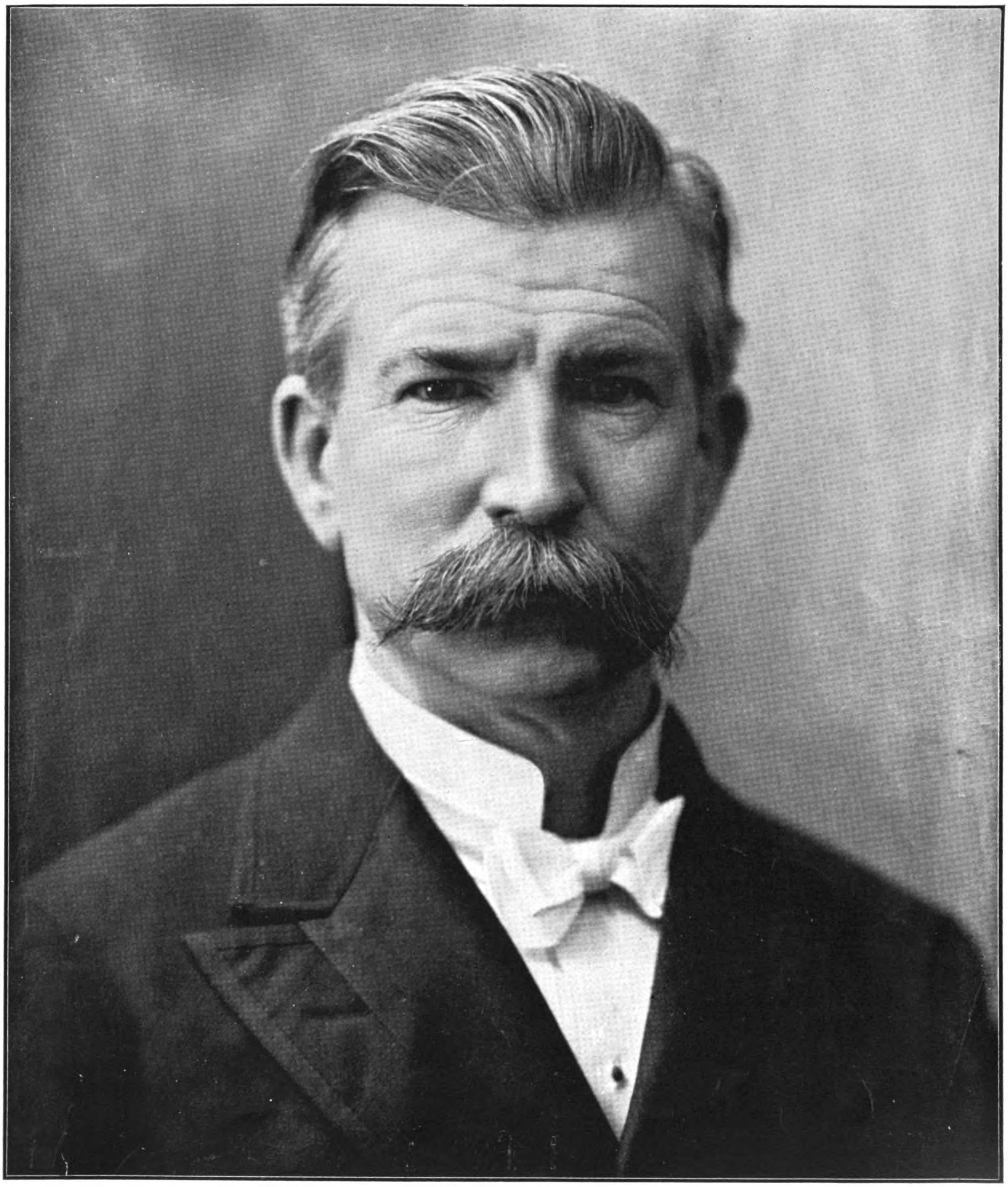
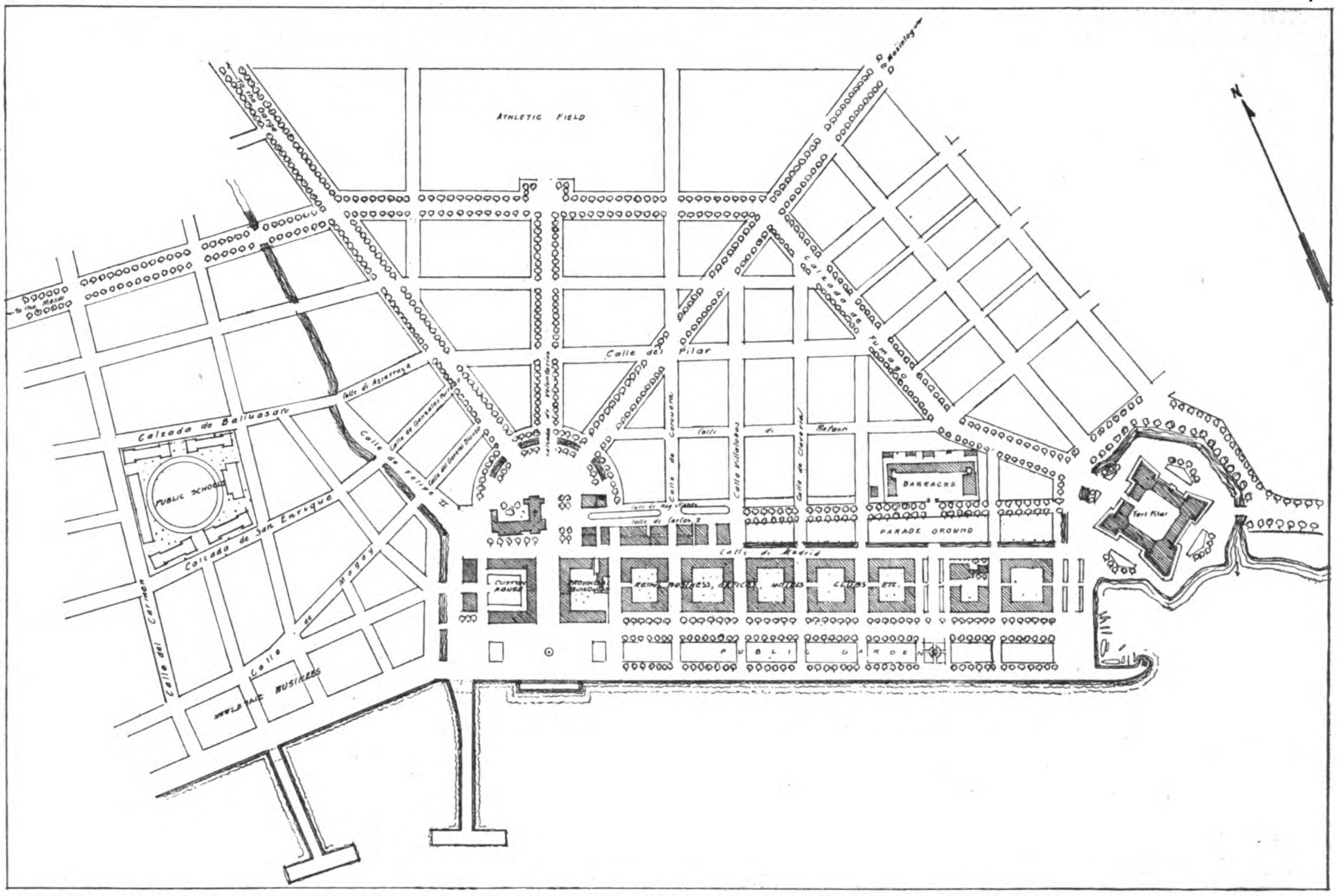
June, Nineteen Hundred and Six



His Excellency Luke E. Wright

First American Ambassador Extraordinary and Plenipotentiary to the Court of His Imperial Japanese Majesty at Tokyo



PRELIMINARY PLAN OF PROPOSED IMPROVEMENTS IN ZAMBOANGA, PREPARED BY MR. W. E. PARSONS, CONSULTING ARCHITECT TO THE PHILIPPINE COMMISSION, AND RECENTLY ADOPTED BY THE LEGISLATIVE COUNCIL OF THE PROVINCE; NOTE THE UNIQUE ARRANGEMENT OF THE PUBLIC SCHOOLS

the general handling of merchandise; the second floor will contain offices; the space in the court and that extending towards the river may be used for 1-story bodegas.

The public schools are located on the site bounded by Calle de Carmen, Calle San Enrique, Calzada de Guzu, and a new street. This site, admirably suited to its purpose on account of its central location and sanitary condition, has already been acquired. The school buildings are arranged in the form of a quadrilateral, being on or parallel to the street lines, and leaving a large court in the center to be used as a play ground. Part of the grounds is well shaded.

BUSINESS SECTION.—In a modern city of commercial importance, the business section should, according to expert builders, be compact, in order that merchandise may be handled at a minimum cost and loss of time. In the case of a seaport it should adjoin the docks and be conveniently near the custom house. Moreover, in a growing town there must be room for the expansion, both of the building area and of the docks.

The section best suited for this purpose at Zamboanga is the site of the present Moro Village, where a considerable amount of business is now transacted. In this section, alone, is there room for unlimited expansion. Mr. Parsons recommends that the temporary pier be replaced by a permanent one on a line about 300′ W. of its present position. This location has the advantage of being near the future custom house and shipping center. Moreover, the development of the civic center as a monumental feature requires an unobstructed view of the sea at this point, while the removal of the noise and dust incident to traffic will be an advantage.

In connection with building for retail business, are considered offices for general business and professional purposes, hotels, apartments, and club houses. Additional area is provided for these by reclaiming from the sea a strip of land about 420′ in width. By this means blocks of about 250′ × 300′ are obtained giving an opportunity for buildings with an exposure both to the sea and on Calle Madrid and the parade grounds. The open courts, around which the buildings are built, may be treated in a variety of ways according to the purposes of the building. On the waterfront the buildings will be preceded by an open space 200′ in width used as a public garden, with roadways, paths and grass plots to diminish the reflection of heat and glare of light. A few trees will be planted here, but not enough to obstruct the view.

Land thus reclaimed at a comparatively small cost becomes public property and will be leased by the government to individuals for a long term of years, affording a considerable public revenue. The cost at Manila of reclaiming ground by means of the hydraulic dredge *Manila*, owned and operated by the Atlantic, Gulf and Pacific Company, Inc., of New York and Manila, is 22 *centavos* (11c gold) per cubic meter. At this rate, if the average depth to be filled at Zamboanga is 3 meters, the cost, once the riprap bulkhead has been constructed, will be 66 *centavos* (33c gold) per square meter of land. Provision will be made in the land leases for the erection of buildings of a proper construction and character, assuring in this way an impression of architectural unity. Such a group of buildings along the waterfront with the public buildings of a monumental character at one end and the Spanish Fort del Pilar at the other, together with the tropical foliage of the public gardens, will give the city an imposing and quite unique appearance. An effort in this direction will be well invested as an advertisement in view of the fact that the city is seen from many ships passing through the Basilan Straits.

SECTIONS FOR RESIDENCES.—The section suitable for residences is quite restricted in area, only that on or near the waterfront being really desirable. To the E. of Fort del Pilar is only a narrow strip of good land, and that will probably be required for military purposes. The ground on the N. is, in its present condition, undesirable for dwellings.

In these circumstances Zamboanga is especially fortunate in having within 3 or 4 ms. such attractive building sites as are offered on the foothills and mountain slopes towards the N. To give this section direct and easy access, the plan provides an avenue 130′ in width leading in a straight line from the center of the city to the gorge. With an unbroken line of shade trees on either side, and with the dome-shaped hilltop at the end of the vista, this avenue will be a feature of exceptional beauty as well as utility. For a part of the distance it will lead nearly parallel to the river The intervening space of about 100 yds. may form a part of the park system, through which may pass the electric railroad when required.

This section will be set aside as a reservation and with the aid of a topographical map receive careful study with a view to establishing a system of connecting drives of gentle grade. Such drives will be laid out at first at small expense as trails or 5′ wagon roads, but will be on the final location of the future drives. Roads of steeper grade, when necessary, will lead to the desirable building sites. The gorge itself, with an encircling drive so that a view from all points may be afforded, will be preserved as a part of the park system and preserved in its present beauty. The surrounding hillsides will be dotted with villas and bungalows. The *mesa*, E. of Zamboanga, will also offer excellent sites for residences.

SYSTEM OF STREETS.—The system of streets shown on the plan provides communication along the waterfront and in three lines converging to the public *plaza* in the center of the city. One of these avenues leads directly to the gorge as described above, another to Masinlog. There is also a broad avenue forming practically the perimeter of the present town site and intersecting the radiating avenues. These avenues are expected to accommodate the through traffic and to be the location for electric roads that may be constructed. The areas between these avenues are divided into rectangles by streets of convenient width. In this sense the present system is preserved, with the criticism, however, that the streets as at present located are too near together and the plots too small. Plots of the size shown on the plan will afford building lots of more suitable size; at the same time the number of streets is diminished, and consequently the cost of maintenance.

In the outlying sections occupied by the native population it is recommended that building laws prohibit the erection or repairing of dwellings nearer the street than at prescribed distance. As the nipa huts are temporary structures of short life, the streets may be gradually widened. Where houses are of such inflammable material it is important that they be separated at intervals by wide streets, in order that conflagrations may be confined to comparatively small areas.

In the preparation of this plan, effort has been made to avoid the condemnation of any valuable improved property. The rearrangement of some of the streets N. of the center will require a readjustment of properties, but since most of the buildings in this section are of nipa it is thought that the desired changes may be made without great expense.

PUBLIC PARKS FOR RECREATION AND AMUSEMENT.—Until a few years ago the parade grounds were well suited for this purpose, but the buildings erected along the shore now obstruct the air and view of the sea. The public gardens along the *quai* on the area to be reclaimed are intended to restore this attractive feature of the old town. The gardens will be adorned with tropical plants, and provided with a bandstand, seats, and every provision for comfort.

The grounds surrounding Fort del Pilar unless necessary for military purposes, will be included in the park system, provision being made for the laying out of grass plots and planting of shade trees, arranged in the form of the outlying bastions which usually surround such fortifications.

In this connection may be considered the canal. Constructed originally as a water supply, this palm-shaded, many-bridged canal has become the most picturesque feature of the town, and will, if possible, be preserved on this account. Through that part of Calle Madrid where additional road way will be required, the water may pass underground, reappearing along the edge of the parade ground. If the banks are made somewhat steeper and well sodded with grass, this canal can be kept in sanitary condition. By making its outlet into the sea just beyond the fort its course is shortened and its current consequently made more rapid.

The use of trees for shade seems to have been quite ignored by the natives and except in a few cases by the Spanish. To Americans it seems that in a tropical climate well-shaded avenues are almost a necessity while esthetically the opportunity for luxurious tropical foliage of contrasting shades and colors is one not to be neglected. A difficulty for which provision has been made, is that of obtaining young trees in sufficient quantities for transplanting. A nursery for the cultivation of these young trees will be established immediately.

METHODS OF CONSTRUCTION.—The first essential in good architecture is the adaptability to climatic and other local conditions. The Spanish builders felt instinctively the truth of this, and after an experience of three centuries have produced in the Philippine Islands an architectural style both beautiful and practical. The most successful builders depend for their effect more on their beautiful proportions, their simple wall surfaces and tile roofs, rather than on decorations and the use of expensive materials. It is expected by Mr. Parsons that the modern use of concrete, strengthened by steel rods to resist the tensile stress caused by earthquakes, will prove to be a more economical and durable method of construction than the use of timbers. Mr. Parsons says the use of galvanized iron for roofs in place of tile is to be regretted. Tile roofs are better adapted to resist the heat than iron and are in the long run more durable and economical.

Such a plan for the development and expansion of Zamboanga as the one presented is based on future rather than present requirements. It is not expected that such improvements will be made at once, but will progress step by step over a long period of years. By keeping pace with the development of the Moro Province, along a definite and well-defined plan, Zamboanga has the opportunity of becoming an important city of convenient arrangement and unusual beauty. This is the view expressed by Mr. Parsons and enthusiastically concurred in by the progressive members of the Legislative Council.

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JAPANESE FISHING INDUSTRY

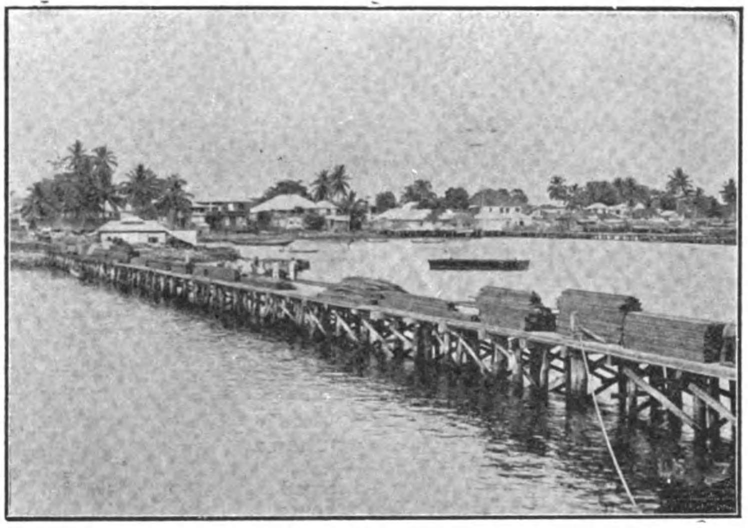
Edward Julian King, American consular agent at Hakodate, reports on the manufacture of fish oil and fish manure in his consular district, where he thinks American machinery for such purposes can be sold to good advantage. He writes:—

During the fishing season, which lasts from the end of March to the end of November, a lookout is kept at all hours of the day and night, from stations on shore and from boats at sea, for the shoals of herring and other fish which form the raw material from which the manure and oil are obtained. After the fish are captured and the nets hauled up on the beach the fish are thrown into inclosures alongside of a number of iron try pots, which are about 4½′ in diameter and 2½′ deep and erected on brick fireplaces, and in these the fish are first boiled. After boiling they are put into wooden presses about 3′ square and 2½′ deep, the sides and bottom of which are composed of slats having a small opening between them. The cover is put on and pressure is then exerted on top by means of levers or stones put on top of the cover, the oil and water pressed from the fish running into a tank, where the water, going to the bottom, is first drawn off and the oil afterwards put into old kerosene cans, soldered up, and is then ready for shipment. The fish, after being pressed, is in the shape of a hard sodden mass, and this is removed from the press, broken into small pieces, and spread out on mats in the sun and dried. When dry it is packed in straw mats and shipped. It is estimated that not more than 60 per cent of the oil is extracted from the fish, while in drying the manure, more than half of the phosphates, the most valuable part, are lost by evaporation and from escaping into the ground. The oil is nearly all exported to Holland and England, but the manure is all used in Japan, and the amount annually produced is not sufficient to supply the demand. In view of these conditions, American citizens can benefit in two ways, as follows:—

First. By the introduction and the sale of American machinery, such as hydraulic presses of the kind used by the fish-manure manufacturers on the Atlantic coast. The machine that would sell best should be light and portable so as to enable it to be shifted from station to station.

Second. By the erection of fishing stations on the Pacific Coast, especially in Southeastern Alaska, and in exporting the fish manure to this country. The offal in all the large salmon canneries, such as heads, entrails, etc., will also work up into manure.

The price of fish manure in Japan is from $40 to $75 United States gold per ton, according to the supply. At present the price in Hakodate is from $58 to $63 per ton of 2,240 lbs., according to the quality. There is no import duty, and intending exporters can therefore easily figure the margin of profit. The price will most probably fall this year, as the war with Russia having ended the supply from Saghalien, which has not been in the market for 2 yrs. will again be present this year; yet it is pretty certain that the price will never be under $40 gold per ton.



ZAMBOANGA PIER AND ANCHORAGE FROM THE MORO QUARTER, AND A CLOSER VIEW OF THE PIER

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

PERSONAL

MR. DAVID J. LENNOX, a prominent engineer of Hongkong, has resigned the secretaryship and management of The Institution of Engineers and Shipbuilders of Hongkong and accepted the position of superintendent of the Peak Tramway. Mr. Lennox is very popular in engineering circles of the colony, and his long experience in the profession gives assurance that he will conduct the affairs of the Peak Tramway with ability and success.

RAILWAYS AND RAILWAY SUPPLIES

CHING-HAI RAILWAY, CHINA.—The board of commerce at Peking has sent four secretaries to inspect the Ching-Hai Railway.

KOWLOON-CANTON RAILWAY.—The Peking authorities have rejected the 4th article of the agreement of the Kowloon-Canton Railway, in which it is stipulated that the chief engineer should be recommended and controlled by the Government of Hongkong.

RAILWAY EXTENSION, F. M. S.—A corps of assistant engineers is being engaged to select and survey the route of the proposed extension of the Federated Malay States Railway to Johore and thus establish a rail connection between Penang (Butterick?) and Singapore.

SIAM WANTS RAILWAY SUPPLIES.—The Government of Siam has issued specifications and drawings of tenders for the supply of 67 passenger cars, 7 guard and luggage vans, and 265 goods and ballast cars for the Royal Siamese Railway Department. Sealed tenders will be opened at Bangkok on September 4th, 1906.

RAILWAY DEVELOPMENT IN SHANTUNG PROVINCE, CHINA.—The governor of Shantung has notified Peking that the concession originally granted to Germans for the building of a railway from Chinanfu to Chingting (on the Peking-Hankow road) has been redeemed, and preparations for the construction of the railway and the opening of steam traffic are progressing.

BRITISH LOCOMOTIVES FOR THE PHILIPPINES.—An important contract for supplying eight powerful 6-wheeled coupled bogie freight locomotives for the Manila Railway Company, Ltd., has, in the face of severe continental competition, been awarded to Messrs. Kerr, Stuart & Co., Ltd., of the Californian Works, Stoke-on-Trent. Early delivery was an important feature in the placing of the contract with British engineers, and the locomotives are shortly to be shipped to Manila.

PEKING-KALGAN RAILWAY.—Work on this line is progressing very rapidly under the charge of Taotai Chan, commonly known as Jeme Tienyao, an American-educated civil engineer, and it is expected that the whole line will be completed before the close of the year 1907 instead of 1908, as at first contemplated. Viceroy Yuan Shih-kai wishes it finished and opened to traffic as soon as possible with the view of having the line extended to the Mongolian capital of Urga and beyond as far as the Siberian frontier. All the railway materials ordered from France have arrived at Tientsin and have been delivered to the railway administration. No foreigners are employed on this line.

TRANSKOREAN RAILWAY.—At a recent conference of the Korean chambers of commerce it was decided to urge upon the authorities the desirability of connecting the southern and northern districts of Korea by the construction of a line to complete a Transkorean Railway. There is still a difference of opinion as to whether the line should run from Pingyan to Gensan or from Seoul to Gensan. The former would be a line about 100 ms. long, and the latter about 103 ms. The Pingyang-Gensan line would present difficulties owing to the precipitous heights at Ma Sin-lyong, but a similar obstacle would be found at Thyol-lyong in the case of the Seoul-Gensan line. There is, consequently, not much choice between routes.

ANOTHER CHINESE RAILWAY PROJECT.—The governor of Honan has asked the Peking Government for the construction of a railway line from Loyang to Tungquan on the borders of Shensi, and from Kaifeng to Chinan. He urges that both of these lines are of the utmost importance considering the central position held by Honan, which is in touch with seven provinces. The usual difficulty of funds, however, presents itself, and the length and difficulty of the latter line render its immediate undertaking almost out of the question. In regard to the Loyang-Tungquan line it is different, however, and though it is estimated to cost something like Tls. 5,000,000 for the 480 *li*, unless it is undertaken the new line from Hsian to Tungkuan which is to be built with the idea of linking up with the Chinghan line can not be connected. The proper Peking authorities have been directed to consider the matter and see what can be done.

ELECTRIC LIGHTING, TRACTION, POWER, ETC.

BENGAL TELEPHONE COMPANY.—This company has started on a big scheme of changing all its overhead wires in Calcutta to underground, involving the laying of 50 ms. of cable.

ELECTRIC LIGHT AT TIENTSIN.—The electric tramway and lighting company of Tientsin, North China, has put its lighting plant in operation and now the city is enjoying this modern convenience.

NEW ROLLING STOCK, MANILA STREET RAILWAY.—The Manila Electric Railroad and Light Company is adding 14 fine cars to its equipment of rolling stock. Four of the cars are half box and half open, the first-class compartment being closed for protection during the wet weather, and the seats extend lengthwise of the car.

ELECTRIC LIGHTS AND POWER, SINGAPORE.—The proposal of the Singapore Electric Tramways, Ltd., to supply the Municipal Commission with electric energy for lighting and fans at the rate of 12½ cts. per board of trade unit, and to supply energy for prime movers with which is classed energy for arc lamps for the public lighting of streets, at 12½ cts. less a discount of 25 per cent per board of trade unit, and that the charge by the Municipal Commission to the public be fixed at 25 cts. per board of trade unit for electric energy for lighting and fans, and for energy for prime movers at 25 cts., less a discount of 25 per cent per board of trade unit, has been accepted by the commissioners.

CHINA ADOPTS WIRELESS TELEGRAPHY.—The American consul-general at Tientsin reports that the Chinese Government has arranged to establish several stations throughout China for experiment with the Marconi system of wireless telegraphy and instruct Chinese operators in working the same. Apparatus was recently installed on four Chinese men-of-war at Shanghai and at the three North China cities of Tientsin, Peking, and Paotingfu, the radius of action being about 230 kilometers and the cost about Tls. 25,000. An Italian officer has been appointed, not only as instructor, but also as engineer to superintend the installation, and under whom a number of students have already been detailed to act as operators and learn the art of management. It is also said that the viceroys throughout the empire have been directed to consider the advisability of establishing other stations to work in conjunction with those above mentioned.

AMERICANIZED MONGOLIANS.—Mr. Lim Dat, a successful Chinese merchant of Victoria, British Columbia, has organized among his countrymen located there a $2,000,000 (gold) company to construct an electric trolley railway in China from Canton to San Wu, in China, a distance of 60 ms. No white man need apply for stock, as their presence in the company would forfeit the charter from the Chinese Government. The route of the proposed line is a populous one, Canton having a population of at least 2,000,000 and San Wu 500,000 The prospectus of the new company sets forth that there are no serious topographical difficulties to be encountered in building the line, that water-power will be obtained from the Quai Tong Shun Mountains, 30 ms. from San Wu; that there are now 22 junks plying on the river between these points, carrying heavy cargoes and many passengers; that it takes these junks 14 hrs. to make the trip, which the electric cars will make in 3 hrs. It is also stated that the summer cars will be operated—the climate being warm—and each will be equipped with 50-h. p. motors. The plan is to build the line entirely with Chinese labor, even using Chinese electricians as far as possible. The company also proposes to seek from the City of Canton a concession for light and power privileges.

PUBLIC WORKS

AYALA BRIDGE, MANILA.—The Atlantic, Gulf and Pacific Company hopes to have the reconstruction of the Ayala Bridge over the Pasig River finished by August 13th.

WATER AND SEWER SYSTEMS, PARANG AND JOLO, P. I.—Henry M. Jones, of Manila, has secured the contract for furnishing the labor and materials for the construction of water and sewer systems at Parang and Jolo. His bid for the Parang works was ₱42,223 and for the Jolo works ₱32,373. He agrees to complete his contracts within 300 days after commencement.

ROAD-MAKING IN KOREA. — With reference to a recent statement that a part of the new Japanese loan to Korea will be used for the construction of new roads, the Korean Government has made arrangements to engage four Japanese engineers and eight assistants for this purpose. The survey for the new roads will be carried out between July and November, and the work of construction is to begin next spring.

EXTENSION OF CONTRACT TIME DENIED, MANILA.—Mr. J. F. Case, chief engineer of the Department of Sewer and Waterworks Construction, Manila, has recommended the denial of the application of Messrs. Matson, Lord & Belser, contractors for the construction of the dam and reservoir of the new gravity water supply, for an extension of time for the completion of their work, and the Municipal Board has approved the recommendation. The contractors have been notified by cable of this decision.

IMPERIAL LIBRARY, TOKYO.—The new building of the Imperial Library at Uyeno Park, Tokyo, has been officially opened. It is three stories high and is constructed with all up to date materials. The completed building does not comprise the whole library design. It is only a quarter of the proposed premises and the remaining three-quarters will be built adjacent to the present building. The cost is -Y-320,000. The new building is the largest library in the Orient, containing about 300,000 books.

PUBLIC WORKS IN MINDANAO, MORO PROVINCE, P. I.—The new fiscal year will mark great activity in the public works of the Moro Province. Besides the projects to be undertaken by the civil government, the chief quartermaster, Department of Mindanao, will spend about -P-250,000 in permanent improvements at the several garrisons of the military. Besides the sewer and water systems at Parang and Jolo, the military will build a dock for the garrison at Cotabato, and a Telford road, cement sidewalks and curbing, and a seawall at Zamboanga. All of the military work will be let by contract.

A BANGKOK BRIDGE.—The bridge near the post and telegraph department in the city, says the *Malay Mail*, which was closed for traffic a year ago, and then apparently forgotten, is still closed though the long-deferred work of repair has been going on for some time Now the passage of the tram cars over it is stopped, too, and the passengers have to get out one side and walk, like hens along a rail, across narrow girders about 4 ins. wide at imminent risk of their necks, to a waiting car on the other side. Judging from the rate of progression now observed, it will be some time yet before it is opened to traffic. There were three men and a boy looking at it this morning. One of the men was working hard chewing betel, and the boy was minding some tools which were ostensibly there for some purpose connected with the bridge.

DEPARTMENT OF ENGINEERING AND PUBLIC WORKS, MANILA.—In 1904 the expenses of this department were -P-2,585,979.15, of which salaries and wages consumed -P-912,580.12, the remaining -P-1,946,399 03 being for contingent expenses and public works. The expenses of the department for the fiscal year 1905-06 amounted to -P-2,682,828.87, a saving of -P-176,150.28 on the total expenditure. Of this total amount the sum of -P-1,026,491.99 was expended for salaries and wages, showing an increase of -P-113,911.87, while the contingent expenses and public works caused an expenditure of -P-1,656,336.88, or a saving of -P-290,062.15. In his estimate for the new fiscal year the city engineer asked the Municipal Board for -P-498,409.97 for salaries and wages, and -P 1,379,096.23 for contingent expenses. The board has reduced this estimate -P-804,776.67 less than last fiscal year and about -P-1,000,000 less than the expenses of the previous year.

PORT WORKS, DOCKS, ETC.

WHARF AT PARANG, P. I.—Salvador Farre, Manila, has secured the contract for the construction of a wharf at Parang, his bid being ₱35,500. He agrees to complete the work within 300 days after its commencement.

NEW DOCK NEAR MOJI, JAPAN.—The scheme promoted jointly by Japanese, Belgians, and Englishmen to construct a large dock at Tanoura, near Moji, has matured, and the work of construction has commenced. The dock will be capable of accommodating vessels up to 20,000 tons.

SINGAPORE HARBOR WORKS.—Mr. Winston Churchill recently said that the Singapore Chamber of Commerce had made representations against the construction of the proposed harbor works there, but Lord Elgin was not satisfied that the representations embodied the wishes of the trading community, and saw no reason further to delay work which was undertaken on the authority of high experts and after prolonged consideration both in London and Singapore.

KAWASAKI DOCKYARD COMPANY at SHANGHAI.—In explanation of the decision of the Kawasaki Dockyard Company to establish a branch dockyard at Shanghai, it is pointed out that a rapid development of Japanese shipping on the China Coast and the Yangtsze is in progress. The Japanese Guardianship Squadron has also to be taken into consideration, while there is a prospect that the Kawasaki company, which has already successfully built a number of naval vessels for the Chinese authorities, will receive a good many such orders in future.

MINES AND MINING

TIN FROM STRAITS SETTLEMENTS.—The total shipments of tin from the Straits Settlements for 1905 amounted to 63,710 tons, 18,905 tons going direct to the United States, 35,294 tons to England, and 9,511 tons to Continental Europe.

MINES IN AMUR.—The Tartar general of Heilungkiang has received a report from an under official to the effect that the mines along the Amur River have been occupied by the Russians. Efforts are being made to drive out the Russians.

GOLD-DUST GATHERING MACHINE.—Mr. Naosaburo Minorigawa, a Japanese inventor of filature and drying machines, has made another invention in the shape of a gold-dust drying machine, by means of which the quality of sands containing gold-dust can easily be ascertained.

FOREIGN MINING ENTERPRISE IN YUNNAN. — The viceroy of Yunnan reports to the Peking authorities that a number of British and French merchants, styling themselves the Hsing Lung Company, are mining cinnabar in the Chohung Prefecture of Yunnan, and declaring they are doing so in accordance with the treaty. Negotiations have been commenced looking to a solution of what has turned out to be a controversy.

MINERALS OF KOREA.—Consul Mitchell, of Chunking, supplies information concerning the mineral resources of Korea, as follows:—The mineral output of Korea is principally gold, recovered both by placer and quartz mining, with over 120 workings, and an annual production of about $2,250,000 gold. Placer gold represents 66 per cent of the total. There are silver deposits, but only experimental workings have been made. Copper is found mostly in the N. and S. portion of the peninsula. The Kap-san mine is producing about 270,000 lbs. of refined copper *per annum*. Iron is found in several provinces, but the expense of mining and smelting have retarded the exploitation. There are some coal deposits, that at Pyeng-Yang consisting of smokeless coal, and the others of rather inferior bituminous. Excellent crystal is found in North Kyeng-Seng, and is a famous product of Korea. Talc of excellent quality is found at Pyeng-hai and Yee Chun, but has not been worked.

BORNEO OIL OUTPUT.—Following is the output of the oil fields of Borneo for the first 13 weeks of the years 1906 and 1905, in tons:—

	1906.	1905.	REMARKS.
Production—			Congestion of sto-
Crude oil ..	115,290 ..	95,070	rage on the fields
Crude oil sold.	— ..	21,210	and at the mark-
Intake of refineries crude oil ..	79,548 ..	63,735	eting centers compelled the practical shutting down of
Output of refineries—	•		the Balik Papan Refinery from Feb-
Kerosene	28,099 ..	23,340	ruary 19th to March
Other products	42,732 ..	30,260	31st and the destruction of
Shipments—			8,700 ts. of crude oil
Kerosene. ..	23,333 ..	24,100	5,510 " benzine
Other products	34,613 ..	34,888	6,800 " liquid fuel.

	Mar. 31, 1906.	Apr. 1, 1905
Crude oil in stock above ground	74,414 ..	33,430
Stock awaiting shipment—		
Kerosene	35,887 ..	7,615
Other products	19,375 ..	7,925

SHIPBUILDING, MARINE, ETC.

REPAIRS OF BATTLESHIP "SUWO."—The repairs of the battleship *Suwo*, late *Pobieda*, were recently completed and the vessel sailed from Shanghai for Japan.

JAPANESE SUBMARINE BOATS.—The Japanese Navy has just had an addition of two submarine boats, which were constructed at the Onohama shipyard, Kobé, and their trial run was recently carried out successfully.

ACTIVITY AT KAWASAKI DOCKS.—The Kawasaki shipbuilding yard, Japan, has finished and sent to China one of the four warships it is building for the Peking Government. The company has recently received an order from the Chinese Government to build six second-class gunboats, ranging from 800 to 1,000 tons each, and four torpedo boats of about 120 tons each.

CABLE LAYING, JAPAN.—The Japanese Government cableship *Okinawa-maru* is reported to be engaged in laying a cable between the Bonin Islands and Hachijoga Shima, and the Pacific Cable Company's steamer is connecting the Bonin Islands with Guam. When these lines are completed there will be a direct telegraphic connection between America and Japan.

CAPTURED FOREIGN VESSELS, JAPAN.—Fifteen of the foreign vessels captured by Japan during the war have been offered for sale by public tender. Among the chief bidders are the Mitsui Bussan Kaisha, the Hokkaido Colliery Railway Company, the Nippon Yusen Kaisha and the Osaka Shosen Kaisha. The Hokkaido Colliery Railway Company is said to contemplate the establishment of a steamship line for coal-transport after its railway is purchased by the government.

OCEAN FREIGHT ROUTE EXTENDED.—The Chargeurs Réunis (a French company) have inaugurated a line of steamers to trade around the world. The vessels start from Havre and Antwerp, and reach San Francisco through the Suez Canal *via* China and Japan. From San Francisco the liners will take cargo to Mexico, Central and South American ports and for Europe. Vessels will leave San Francisco at intervals of 60 days, and the service is expected to prove of considerable value to the merchants of that city.

MISCELLANEOUS

MANUFACTURE OF SWORDS, TIENTSIN.—The new Tientsin Native Ironworks is reported to have large orders for swords on hand.

MESSRS. RILEY, HARGREAVES & CO., LTD., SINGAPORE.—This concern has supplied Tronoh Mines with a Darracq car which is said to have cost $5,000 gold.

JAPAN'S PROFITS FROM TOBACCO.—The actual net profits of the tobacco monopoly of Japan for the fiscal year 1905 was -Y-33,284,000, or $16,642,000 gold, and exceeded the estimated figures by -Y-1,272,000, or $636,500 gold.

CONTRACT FOR MACHINE OILS, MANILA.—Messrs. Findlay & Co., of Manila, have secured the contract from the Bureau of Supplies, Philippine Government, to supply the latter with fine and crude machine oils for a year. The firm represents the New York Lubricating Company.

AGRICULTURAL IMPLEMENTS, KOREA.—With improving farming methods the Koreans require more elaborate agricultural implements than those heretofore in use, and while there may never be a demand for harvesters and threshing machines, cheap plows, rakes, scythes, and sickles should be appreciated.

PINE AND REDWOOD LUMBER CONTRACT, PHILIPPINE GOVERNMENT.—Messrs Findlay & Co., Manila, have secured the contract for supplying the Government of the Philippine Islands with pine and redwood lumber for the coming 6 mos., during which it is estimated, that 2,000,000 board feet of lumber will be consumed.

MIRROR FACTORY, MANILA.—Messrs. Squires, Bingham & Co., of Manila, have just established a first-class modern looking-glass factory in connection with their establishment in Plaza de Goiti. They have installed a plant which will turn out all kinds of mirror work. This is the only factory of its kind in the Orient.

JEHOL TIMBER.—The woods and forests at Jehol are reported to be very extensive, comprising timber which can be used as material for conspicuous buildings, such as the Chien Men Tower, but there is no available route of transportation. The lieutenant-general of Jehol is said to have an agreement with the minister of northern trade looking to the construction of a railway from Lanchow to Jehol.

MACHINERY IN KOREA.—The Japanese capitalists interested in Korea have heretofore imported most of their machinery from their own country. Under the present customs tariff, machinery taken into Korea pays 7½ per cent duty, while the same articles are taxed 15 per cent on the total cost and transportation in Japan. An attempt by American and European houses to institute a direct trade in machinery for the numerous sawmills on the Yalu, in mining appliances, and chemicals should be successful.

BOUNTY TO SUGAR GROWERS, AUSTRALIA.—A new law in Australia provides for the payment after January 1st, 1907, to every grower of white-grown cane or beet a bounty of $1 50 gold per ton on cane yielding 10 per cent of sugar, to be increased or decreased proportionately according to any variation of the standard, and a bounty of $15 gold per ton on the sugar-giving contents of the beet. It must be shown that the planter paid the standard rate of wages to the employees. There is to be an excise duty of $1 gold per hundred on manufactured sugar, but that is to be reduced on sugar produced from cane.

SHANGHAI TRADE REPORT.—According to the official report of Mr. Elgar Hobson, commissioner of Chinese customs at Shanghai, from many standpoints 1905 may be regarded as a *record* year and as far ahead of any preceding. The gross value of the trade was Hongkong Tls. 413,954,262, and the net value Hongkong Tls. 176.979,193, showing increases of Tls 39,000,000 and Tls. 31,500,000 respectively over the 1904 totals. The total revenue collection was Hongkong Tls. 12,080,185, an increase of Tls. 1,775,000 over the total in 1904 and of Tls. 1,125,000 over that for 1902, the best year previously recorded. Nearly the whole of this gain is accounted for under the head of "Imports."

ICE AND REFRIGERATING SAFETY DEVICE.—The Vulcan Iron Works, of San Francisco, which has taken the agency for the Pacific Coast of the United States and the Philippine Islands, is manufacturing a new device recently invented. It is designed to prevent accidents from excessive pressure in ice and refrigerating systems. It is constructed with a sort of safety valve, so connected that when the pressure in the pipes gets too high it disengages a catch, releasing a lever which is actuated by a powerful spring. This lever in turn strikes an electric switch, breaking the circuit and stopping the ammonia compressor. This can be effected in several ways, *viz*., by cutting off the current when the compressor is electrically driven, by putting out the spark when a gas engine furnishes power or by shutting off the steam power.

ARMSTRONG UNDERTAKING AT HIRATSUKA, JAPAN.—With regard to the undertaking of the Armstrong Company at Hiratsuka, it is understood that the nature of the industry is the manufacture of cordite for the Japanese Navy. The factory is a joint undertaking of three big foreign concerns—Armstrong, Noble, and another. The explosive has hitherto been imported from abroad. Under the present arrangement the expenses involved in the importation, amounting annually to something like -Y-280,000, will be dispensed with, besides the indirect revenue derived from the business tax and import duties on materials. The factory will give employment to about 5,000 laborers. German experts are now engaged in drawing up plans and estimates for the construction of the factory, on the completion of which it is expected that Hiratsuka will become an important town in the prefecture.

SAWMILLS IN KOREA.—Even though the Japanese Government may declare a timber monopoly on the Yalu, the Japanese, while they are excellent carpenters, have never undertaken lumbering on a very extensive scale, and it should be possible for foreigners to establish sawmills on the Yalu where the timber would be purchased from the authorities. The demand for lumber in China is constantly increasing, the imports of soft wood into Shanghai and Tientsin alone amounting to about $350,000 gold during 1904 The native article is never properly seasoned, for it is generally transported in logs and sawed as needed for immediate building. Large mills operating at Yongampo or Antung would be able to take advantage of the low cost of labor and of the cheap transportation by junks, which make the voyage to Tientsin or Chefoo in from 5 to 10 days, and it would not only supply a long-felt want in China but be an undoubted source of profit to their owners.

RIVER STEAMERS KOREA.—Owing to the character of the streams on the W. coast of Korea the river traffic is as yet in its infancy. The vessels employed are of the type used for deep-sea and harbor work and are not at all adapted to local conditions. Under the most-favored-nation clause it is possible for foreigners to take advantage of the agreement recently concluded between Japan and Korea, granting the subjects of the former the privileges of navigation along the coasts and on the interior waters of the latter state, to introduce a number of light-draft river steamers, stern-wheeled and drawing from 2 to 8′. The rivers are the natural avenues of commerce and a profitable trade only awaits improved methods of transportation.

With a development of this character and the improved communications afforded by the railroads the commercial activity attendant on the influx of Japanese and the opening of new mining districts, the present well-being of the people, thanks to their large earnings during the past year and the additional prosperity that should result under an administration wisely directed by the Japanese, the oportunities for trade and manufacture should offer an attractive field for foreign enterprise and a profitable investment for foreign capital.

FINANCIAL

YINGKOW BRANCH OF THE RUSSO-CHINESE BANK.—This branch has been reopened to business in the Russian consulate building.

GOLD COINS FOR SIAM.—It is announced that the Siamese Government is making arrangements to put gold coinage in circulation shortly. The gold pieces will be of Tcs. 20 and Tcs. 10 value respectively.

IBARAGI SAITAN KAISHA, JAPAN.—This colliery company intends to increase its capital by -Y-500,000. The company at present owns an anthracite field which is said to turn out 10,000,000 lbs. of coal per month.

BANGKOK DOCK COMPANY.—The Bangkok Dock Company made a profit of Tcs. 155,000 in 1905. A 12½ per cent dividend and 2½ per cent bonus have been distributed among stockholders, the total sum being Tcs, 100,000.

CHINA MUTUAL STEAM NAVIGATION COMPANY.—The directors of this company have recommended dividends of 5 per cent on the ordinary and on the ordinary "B" shares for 1905, leaving a balance of £12,052 to carry forward.

BIG FOREIGN LOAN TO JAPAN.—It is announced that Jacob Schiff, the American banker and railway promoter, has agreed to loan to Japan -Y-2,000,000,000 on the security of Japanese railways when they are consolidated under the nationalization scheme.

KOREAN WATERWORKS.—This Company have been registered with a capital of £250,000 in £1 shares, to adopt an agreement with the S. W. Syndicate, Ltd., for the acquisition of a concession for the construction and maintenance of waterworks in Seoul and elsewhere in Korea, and to carry on the business of a waterworks Company in all its branches.

JAVA CAOUTCHOUC COMPANY.—This company has been established at Amsterdam with a capital of fl 200,000, divided into 200 shares of fl.1,000 each, which are all taken. The object of the company is the cultivation of caoutchouc and other produce in Netherlands India, with the exception of the districts of Djokjokarta and Soerakarta, and the sale of the produce in foreign ports.

SINGAPORE SLIPWAY COMPANY.—The 1905 working of this company resulted in a loss of $9,965.16 owing to depression in the shipping trade; in consequence, at the recent annual meeting of the shareholders, the directors announced that they had decided to write back to profit and loss $10,000 placed to reserve in December, 1903. The sum of $2,879.11 has been written off account depreciation of property, plant, etc., and $1,410.85 off account bad debts. This, after deducting the credit of $2,539.44 brought forward from 1904, left a debit balance at profit and loss of $1,715.68 to be carried forward to the current year.

TARLAC (P. I.) RAILWAY COMPANY —Articles of incorporation of the Tarlac Railway Company have been filed at Manila with the chief of the Division of Archives, Patents and Copyrights. The board of directors comprises Walter E. Olsen, Manila; Vicente Bengzon, Camiling, Tarlac; Melecio Cajuanco, Panique, Tarlac; J. F. Case, Manila; Arcadio del Rosario, Panique; E. E. Elser, Manila; A. V. Dalrymple, Tarlac; and H. Thurber, Manila. The capital stock of the company is -P-150,000 divided into shares of -P-100 each, and the project of the company is to construct and operate a steam tramway between the Panique Station of the Manila & Dagupan Railway to the Pueblo of Camiling, in Tarlac Province, Northern Luzon.

CHARTERED BANK.—The balance sheet and profit and loss account of the Chartered Bank for the year ended December 31st, 1905, recently made public, show a net profit, after providing for bad and doubtful debts, of £342,111 14*s* 4*d*, inclusive of £80,078 16*s* 8*d* brought forward from the previous year. The interim dividend at the rate of 12 per cent *per annum* paid in October last absorbed £48,000, and a further sum of £17,000 has been appropriated to pay a bonus of 10 per cent on the salaries of the staff. The amount available is, therefore, £277,111 14*s* 4*d* out of which the following will be paid:—Final dividend at the rate of 14 per cent *per annum*, making 13 per cent for the whole year; add £100,000 to the reserve fund, which will then stand at £975,000; add 10 per cent to the officers' superannuation fund; write off premises account, £25,000, and carry forward the balance of £85.111 14*s* 4*d*. The fees of the directors have been increased from £4,000 to £6,000 per year.

FAR EASTERN SHARE QUOTATIONS

COURTESY OF BENJAMIN, KELLY & POTTS, SHAREBROKERS, HONGKONG, June, 1906.

STOCK	WHEN ESTABLISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	AT WORKING ACCOUNT	DATE	LAST DIVIDEND	WHEN PAID	Approximate Return at Present Quotation* PER CENT	CLOSING QUOTATIONS
Banks.												
Hongkong and Shanghai Banking Corporation	1865	$10,000,000	80,000	$125	$125	g £1,000,000 s $9,500,000 i $250,000	$1,699,777	31-12-05	£1.15/- div. & £1 bonus @ ex. 2/0-9/16 $26.87 for second half-year 1905	26 2-06	5¾	$810 London £91
National Bank of China, Limited	1891	£699,475	(10) 99,925	£7	£5	c £12,735 $150,000	$74,099	31-12-05	$2 (London 3/6) for 1903	1-2-04	—	$38
Marine Insurances.												
Canton Insurance Office, Limited	1881	$2,500,000	10,000	$250	$50	$1,600,000 j $147,895	$211,540	31-12-04	$20 for 1904	21-10-05	5½	$360
North China Insurance Co., Ld.	1863	£150,000	10,000	£15	£5	g £100,000 s Tls. 100,000 f Tls. 50,000	Tls. 302,053	30-6-05	Interim div. of 7[16 @ ex. 2[10 15=Tls. 2.62. on a[c 1905	5-1-06	5¾	Tls. 85 sales
Union Insurance Society of Canton, Limited	1867	$2,500,000	10,000	$250	$100	s $2,000,000 g £40,000 f $331,131 j $1,153,844 u $569,279	$2,792,271	31-12-05	Interim div. of $30 for 1905	30-4-06	5	$800 buyers
Yangtsze Insurance Association, Ld.	1862	$800,000	8,000	$100	$60	$800,000 j $61,278 f $15,527	$508,334	31-12-05	$12 and $3 special dividend for 1904	19-4-06	8½	$175
Fire Insurances.												
China Fire Insurance Co., Ld.	1870	$2,000,000	20,000	$100	$20	$1,000,000 x $229,488 f $2,616	$344,098	31-12-05	$6 for 1904	9-3-06	7	$85
Hongkong Fire Insurance Co., Ld.	1868	$2,000,000	8,000	$250	$50	$1,220,928	$422,618	31-12-05	$25 for 1904	8-3-06	8	$305
Shipping.												
China and Manila Steamship Co., Ld.	1882	$750,000	(1) 30,000	$25	$25	$6,000	$6,563	31-12-05	$1½ for 1905	15-3-06	7¼	$21 buyers
Douglas Steamship Co., Ld.	1883	$1,000,000	20,000	$50	$50	$264,638 i $88,941	Nil.	30-6-05	$3½ for year ended 30-6-1905	25-9-05	8¾	$40 buyers
Hongkong, Canton and Macao Steamboat Company, Ld.	1865	$1,200,000	80,000	$15	$15	e $250,000 d i $600,000 f $154,331	$24,080	31-12-05	$1 for 2nd half-year mak. $2 for 1905	16-2-06	8	$24¾ buyers
Indo-China Steam Navigation Company, Ld.	1882	m £600,000	(2) 60,000	£10	£10	£120,000 i £241,150 h £3,999	£4,435	31-12-04	12/- @ 1/10 ⅞=$6.29.51 for 1904	13-7-05	8½	$75 sellers
Shanghai Tug and Lighter Co., Ld. Do. Preference.	1903	Tls. 1,500,000	200,000 100,000	Tls. 50	Tls. 50	i Tls. 40,000	Tls. 23,156	31-12-05	Final of Tls. 3. making Tls. 5 for 1905 Final of Tls. 1¾ making Tls. 3½ for 1905	13-3-06	8 7	Tls. 63 sales Tls. 51 buyers
"Shell" Transport & Trading Co., Ld.	1898	£2,000,000	2,000,000	£1	£1	£400,000 i £4,144	£107,815	31-12-04	1/- (Coupon No. 6) for 1905	1-1-06	4	27/-_
"Star" Ferry Co., Ld.	1898 1900	$200,000	10,000 10,000	$10 $10	$10 $5	$65,000 i $32,957	$218	30-4-06	$1.50 75 cents for year ended 30-4-1906	31-5-06	5 3½	$30 $21
Taku Tug & Lighter Co., Ld.	—	Tls. 1,500,000	30,000	Tls. 50	Tls. 50	Tls. 98,000 d Tls. 350,479 e Tls. 48,000 i Tls. 81,200	Tls. 13,913	31-12-05	Final of Tls. 2 making Tls. 4 for 1905	1-3-05	9¾	Tls. 41 buyers
Refineries.												
China Sugar Refining Company, Ld.	1878	$2,000,000	20,000	$100	$100	$850,000 e $450,000 r $86,129	$40,419	31-12-05	Final of $15 making $25 for 1905	22-3-06	15	$165
Luzon Sugar Refining Company, Ld.	1882	$700,000	7,000	$100	$100	none	Dr. $132,588	31-12-05	$3 for 1897	24-3-98	—	$25
Perak Sugar Cultivation Co., Ld.	—	Tls. 350,000	7,000	Tls. 50	Tls. 50	Tls. 100,000	Tls. 3,723	31-7-05	Tls. 2½ for year ending 30-9-1904	20-12-04	—	Tls. 102½ buyers
Mining.												
Chinese Engineering & Mining Co., Ld.	1901	£1,000,000	1,000,000	£1	£1	d £80,000 h £12,289	£13,355	28-2-05	1/-(No. 6) int. d. for 12 m. endg. 28.2.06	1-5-06	7	Tls. 10 Nominal
Oriental Consolidated Mining Co., Ld.	1901	G. $5,000,000	y 500,000	G. $10	G. $10	none	G. $909,050	30-6-05	Final of 50 cts. mak. G. $1 for 1905	21-12-05	7	G. $14
Raub Australian Gold Mining Co., Ld.	1892	£200,000	150,000 50,000	£1 £1	18/10 £1	£4,873	Dr. £8,745	31-3-05	No. 12 of 1/-=48 cents	28-1-01	—	$3 buyers

STOCK	WHEN ESTABLISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	AT WORKING ACCOUNT	DATE	LAST DIVIDEND	WHEN PAID	Approximate Return at Present Quotation * PER CENT	CLOSING QUOTATIONS
Docks, Wharves and Godowns.												
Fenwick (Geo.), & Company, Ld.	1889	$450,000	z 18,000	$25	$25	$70,000	$8,915	31-12-05	$2 on old & $1 on new issue for 1905	12-3-06	9	$22
Hongkong and Kowloon Wharf and Godown Co., Ld.	1886	$2,000,000	40,000	$50	$50	$550 000 d.r. $65,160 i $20,000	$20,040	31-12-05	Final of $3½ making $6 for 1905	15 3-06	5¾	$103
Hongkong & Whampoa Dock Co., Ld.	1866	$2,500,000	50,000	$50	$50	$49,500	$362,323	31-12-05	$6 for second half year 1905	27-2-06	7½	$160
New Amoy Dock Co., Ld.	1892	$67,500	10,000	$6¾	$6¾	$88,000	$2,221	31-12-05	$1 for 1905	1-3-06	5 ½	$18
Shanghai Dock and Engin'g Co., Lt.	1901	T5,520,000	55,200	T100	T100	T1,000,000	T34,924	30-4-05	Interim of Tls. 4 for year 1905-6.	6-1-06	10¼	T115 sellers
Shanghai and Hongkew Wharf Co. Lt.	1902	T3,200,000	32,000	T100	T100	b T487,210 r T100,734	T57,065	31-12-05	Final of T8 making T14 for 1905	29-3-06	6¼	T225 sellers
Vulcan Ironworks, Ltd.	1905	T500,000	1,000	T500	T375	—	—	—	First year	—	—	T375 buyers
Yangtsze Wharf and Godown Co., Ld.	1902	T250,000	2,500	T100	T100	T30,000	T5,668	31-12-05	T18 for 1905	31-3-06	8¼	T220 buyers
Lands, Hotels and Buildings.												
Anglo-French Land Investment Company, Ltd.	1906	T2,500,000	(3) 25,000	T100	T100	—	—	—	First year	—	—	T100
Astor House Hotel Co., Ltd.	1901	$750,000	(4) 30,000	$25	$25	$14,156	$9,028	30-6-05	$2½ for year ending 30-6-1905	20-8-05	8	$31 buyers
Astor House Hotel, Ld. (Tientsin)	—	T100,000	2,000	T50	T50	e T34,000 T8,000	T1,013	28-2-06	Final of T6½ making T11½ for year ending 28-2-03	25-4-06	7¼	T147 sellers
Central Stores, Ld.	—	$451,845	6,000	$15	$15	—	$4,719	31-12-05	$2.40 on $12 for 1905	13-3-06	13¼	$18 sales
Do. (Founders')	—		123	$15	$12				None	—	—	$300 buyers
Do. (New Issue)	1904		24,000	$15	$15				7% on $7½ for 1905	13-3-06	—	$15¼ sellers
Hongkong Hotel Co., Ld.	1866	$600,000	12,000	$50	$50	$648,975 r $24,071	$619	31-12-05	$5 for 2d half-year making $10, 1905	6-3-05	7½	$130
Hongkong Land Investment and Agency Co., Ld.	1889	$5,000,000	50,000	$100	$100	e $250,000	$67,839	31-12-05	Final of $3½ making $7 for 1905	2-2-06	6	$118
Hotel des Colonies Co., Ld.	1902	T225,000	9,000	T25	T25	n T29,783	T1,935	31-3-06	Final of 6% making 10% for 1905	31-5-06	14	T18 sellers
Hotel Metropole Company, Limited	1904	$200,000	2,000	$100	$100	none	$4,699	30-6-05	Final of $6 making $10 for the year.	26-7-05	10	$100
Humphreys' Estate & Finance Co., Ld.	1887	$1,500,000	150,000	$10	$10	i $208,386 e $50,000	$5,070	31-12-05	80 cents for 1905	12-2-06	7	$11½
Kowloon Land and Building Co., Ld.	1889	$300,000	6,000	$50	$30	none	$574	31-12-05	$2½ for 1905	7-2-06	6½	$39
Shanghai Land Investment Co., Ld.	1888	T2,600,000	52,000	T50	T50	T869,403 e T170,000	T52,194	31-12-05	Final of Tls. 3 making T6 for 1905	23-2-06	5	T116½ sales
Tientsin Land Investment Co., Ld.	1902	T772,600	7,726	T100	T100	i T71,588	T385	31-12-05	Final of Tls. 5 making Tls. 8 for 1905	24-2-06	7	T110
West Point Building Co., Ld.	1889	$625,000	12,500	$50	$50	none	$772	31-12-05	Final of $1.90 making $3.65 for'05	2-2-06	7	$53
Cotton Mills.												
Ewo Cotton Spinning and Weaving Co., Ld.	1895	T1,000,000	(5) 20,000	T50	T50	T45,939	T100,000	31-10-05	T8 for year ended 31-10-1905	18-12-05	11½	T70 sales
Hongkong Cotton Spinning, Weaving and Dyeing Co., Ld.	1901	$1,250,000	125,000	$10	$10	e $30,000	$23,264	31-7-05	$1 for year ended 31-7-1905	4-9-05	7	$14 buyers
International Cotton Manufacturing Co., Ld.	1895	T750,000	(6) 10,000	T75	T75	T100,000	T18,718	30-9-05	Interim of 3% a/c 1898	30-4-98	—	T64 sellers
Laou-kung-mow Cotton Spinning & Weaving Co., Ld.	1895	T800,000	(7) 8,000	T100	T100	none	T30,760	31-12-05	Tls. 8 for 1905	21-2-06	11	T73 sales
Soey Chee Cotton Spinning Co., Ld.	1895	T1,000,000	2,000	T500	T500	l T18,456	T35,986	31-12-05	Tls. 25 for 1905	7-3-06	8	T310 sellers
Miscellaneous.												
Anglo German Brewing Co., Ltd.	1904	$100,000	4,000	$100	$100	none	$1,066	31-12-05	$7 for 1905	1-3-06	7¼	$95 sellers
Bell's Asbestos Eastern Agency, Ld.	1895	£5,377.10s	3,604	12/6	12/6	£314	£770	31-12-04	1s. 3d for 1904	21-7-05	9	$7½ buyers
Campbell, Moore & Co., Ld.	1886	$12,000	1,200	$10	$10	$9,000	$1,097	31-12-05	$3 for 1905	2-4-06	9¼	$32
China-Borneo Co., Ld.	1903	$720,000	(8) 60,000	$12	$12	none	Nil	31-12-05	$1 for 1904	17-3-05	—	$7 buyers
China Flour Mill Co., Ld.	—	T200,000	4,000	T50	T50	T50,000	T889	31-12-05	Final of T 5 making T 10 for 1905.	17-3-06	12½	T80 sales
China Light and Power Co., Ld.	1901	$500,000	50,000	$10	$10	none	$1,219	28-2 06	60-cents for year ending 28-2-1906	9-4-06	6	$10¼
China Provident Loan and Mortgage Co., Ld.	1898	a $1,000,000	100,000	$10	$10	$100,000	$4,791	31-12-05	80 cents for 1905	22-1-06	9	$9
Dairy Farm Company, Ld.	1896	$187,500	25,000	$7½	$6	$25,000	$2,864	31-7-05	$1.20 for year ending 31-7-1905	24-11-05	7½	$16

STOCK	WHEN ESTABLISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	AT WORKING ACCOUNT	DATE	LAST DIVIDEND	WHEN PAID	Approximate Return at Present Quotation* PER CENT	CLOSING QUOTATIONS
Miscellaneous.—Continued												
Green Island Cement Co., Ld.	1889	$1,500,000	150,000	$10	$10	*p* $410,000 / $500,000	$52,291	31-12-05	$2 div. & 50 cents bonus for '05	26-2-06	8½	$28¾
Hall & Holtz, Ld.	—	$420,000	21,000	$20	$20	$186,000	$20,893	28-2-06	$2½ for year ending 28 2-06	26-4-06	11¼	$22 sales
Hongkong Electric Co., Ld.	1889	$600,000	60,000	$10	$10	none	$2,568	28-2-06	$1.00 / 65 cents } for 10 months ending 28-2-06	13-5-06	7¾	$15½ sales
Hongkong High-Level Tramways Co., Ld.	1887	$125,000	1,250	$100	$100	$50,000	$2,796	30-11-04	$15 for year ending 30-11-04	24-12-04	6½	$235
Hongkong Ice Company, Ld.	1881	$125,000	5,000	$25	$25	*k* $80,000	$3,776	31-12-05	Final of $15 making $19 for 1905	16-2-06	8	$240 buyers
H'kong Rope Manufacturing Co., Ld.	1883	$500,000	50,000	$10	$10	$61,000	$5,813	31-12-05	$9 for 1905 On 5 shares	15-3-06	6¼	$29
Hongkong Steam Waterboat Co., Ld.	1900	$150,000	15,000	$10	$10	$2,500	$88	30-9-05	Final of 50 cents making $1 for year ended 30-9-1905	24-11-05	11	$9
Maatschappij tot Mijn-, Bosch-en Landbouwexploitatie in Langkat	1902	Gs.2,500,000	25,000	G.100	G.100	*i* T547,500 / T27,603	T10,374	31-10-05	First quarterly dividend of T7½ account 1906	15-3-06	9¾	T230 buyers
Mondon, (E. L.) Ld.	1902	T350,000	7,000	T50	T50	none	*Dr.* T81,060	31-12-05	T5 for 1902	2-5-03	—	T25 sellers
Philippine Company, Ld.	1904	$675.000	67,500	$10	$10	none	*Dr.* P34,324	31-12-05	None	—	—	$5 buyers
Shanghai Gas Co., Ld.	1903	T800,000	16,000	T50	T50	*d* T165,000	T11,017	31-12-05	T3 final & T1½ bonus making in all T8½ for 1905	7-3-06	6¼	T135 sellers
Shanghai Horse Bazaar Co., Ld.	1904	T270,000	5,400	T50	T50	T45,000	T9,751	31-12-05	T6 for 1904	17-3-05	11	T55 sellers
Shanghai Pulp and Paper Co., Ld.	—	T450,000	4,500	T100	T100	*e* T37,000 / T8,000	T2,753	31-12-05	Final of T8 making T14 for 1905	27-2-06	9¼	T150 sellers
Shanghai Sumatra Tobacco Co., Ld.	1902	T600,000	(*9*) 30,000	T20	T20	*w* T24,820 / T25,000	T1,452	31-10-05	Final of T3 making T5 for the year.	15-3-06	7	T72 sales
Shanghai Waterworks Co., Ld.	1881	£288,000	8,175 / 7,200	£20 / £20	£20 / £10	T190,000	T85,592	31-12-05	Final of 37/6 making 52/6 for 1905 / First year	29-3-06 / —	— / —	T370 sellers / T280 sales
South China Morning Post, Ld.	1903	$150,000	6,000	$25	$25	none	*Dr.* $44,089	29-2-05	None	—	—	$20
Steam Laundry Co., Ld.	1902	$100,000	20,000	$5	$5	none	$1,134	31-5-05	50 cents for year ended 31-5-05	20-11-05	8¼	$6
Tientsin Waterworks Co., Ld.	1901	T200,000	2,000	T100	T100	*e* T15,259 / T4,000	T1,012	30-4-05	Interim of T4 for year 1905/6	12-2-06	7¾	T. 110
United Asbestos Oriental Agency, Ld. / Do. do (Founders')	1896	$100,000	9,900 / 100	$10 / $10	$4 / $10	$22,000	$551	31-5-05	80 cents / $19.80 } for year ended 31-5-05	29-7-05	9 / 11	$9 / $180
Watson (A. S.) & Co, Ld.	1886	$900,000	90,000	$10	$10	$300,000 / $25,000	$7,734	31-12-05	Final of 50 cents making $1, for 1905	14-5-06	7½	$13¼ buyers
William Powell, Ld.	1901	$150,000	15,000	$10	$10	*e* $4,500	$676	30-6-06	Interim div. of 50 cents for the year 1905/6	10-4-06	10	$10½

LOANS AND DEBENTURES	AGENTS FOR THE LOAN	AMOUNT OF LOAN	PAR VALUE	OUT-STAND'G BONDS	WHEN PAYABLE	CLOSING QUOTATIONS
China Government, 7 per cent. Silver Loan 1886 E.	Hongkong & Shanghai Bkg. Cor.	T767,200	T250	1914	Mar. 31st & Sept. 30th each year until Mar. 31st, 1917.	par. (Plus accrued interest)
Hongkong Hotel Co., Ltd., 6% Mortgage Debentures of 1899‡	Hongkong & Shanghai Bkg. Cor.	$500,000	$500	§ all	Half yearly, June 30th and December 31st	par. (Plus accrued interest)
Shanghai & Hongkew Wharf Company, Ltd. 6% Debentures of 1902	Hongkong & Shanghai Bkg. Cor.	T543,900	T100		Half yearly, June 30th and December 31st.	T96 (Plus accrued interest)
Astor House Hotel Co., Ltd. 8% Debentures of 1903	Hongkong & Shanghai Bkg. Cor.	T500,000	T100		Half yearly, January 1st and July 1st	T105 (Plus accrued interest)
Chinese Engineering & Mining Co., Ltd., 6% Debentures of 1903†		£500,000	¶	£431,960	Half yearly, June 30th and December 31st	par. (Plus accrued interest)
International Cotton Manufacturing Co., Ltd. 6% Debentures of 1901	Russo Chin. Bk.	T500,000	T100	‖	Half yearly, March 31st and September 30th	par. (Plus accrued interest)

a Auhorized capital $2,000,000.
b Building Reserve Account.
c Capital Reserve Fund.
d Depreciation Fund.
e Equalization of Dividend Fund.
f Exchange and Investment Fluctuation Account.
g Gold Reserve Fund.
h Exchange Reserve Account.
i Insurance Fund.
j Reinsurance Fund.
k Contingencies Account.
l Legal Reserve Fund.
m Authorized Capital £1,200,000.
n Sinking Fund.
o
p Premium on New Issue.
q
r Repairs and Renewals Account.
s Silver Reserve Fund.
t
u Underwriting Suspense Account.
v
w Special Works Fund.
x Extra Reserve Fund.
y 72,560 owned by the Company.
z 6,000 shares unissued.
1 5,725 shares unissued.
2 First issue of 60,000 of which 10,411 unalloted.
3 5,000 shares unissued.
4 7,600 shares unissued.
5 5,000 shares unalloted.
6 1,616 shares unalloted.
7 842 shares unissued.
8 14,000 shares unissued.
9 17,000 shares unissued.
* Based on last year's dividend.
‖ Only Tls. 134,000 taken up.
§ 216 held by the Company.
¶ In certificates of £20 and £100.
‡ Redeemable in 10 years, or at option of Company the Company giving 6 months' notice.
† Redeemable at par at rate of £10,000 per annum from 31st December, 1903, to 31st December 1952.
Dr. Deficit.

SINGAPORE SHARE QUOTATIONS.

COURTESY MESSRS. FRASER & CO., BROKERS, SINGAPORE, JUNE, 1906.

NAME	DATE OF FORMATION	CAPITAL	CAPITAL PAID UP	NO. OF SHARES	ISSUE VALUE	PAID UP	RESERVE	LAST DIVIDEND	SINCE LAST MAIL		CLOSING QUOTATIONS
									HIGHEST	LOWEST	
Mining.									$	$	$
Belat Tin Mining Co., Ltd	1903	$300,000	300,000	30,000	10	10			5.00	4.00	5.00 sales & buyers
Bersawah Gold Mining Co., Ltd	1900	$175,000	140,000	10,000 *1*	10	10					12.50 sellers
" " " " " Deferred.				4,000	10	10					8.00 sellers
Duff Development Co., Ltd	1903	£400,000	350,000	350,000 *2*	1	1					5.00 sellers
Bruseh Hydraulic Tin Mining Co., Ltd	1901	$600,000	600,000	60,000	10	10					15.00 sales
Kadana Gold Mining Co., Ltd	1901	$300,000	300,000	20,000	10	10					2.00 sellers
" " " " " *Pref.*				10,000	10	10					10.00 nominal
Kechau Goldfields, Ltd. *Fully paid*	1902	£30,000	16,175.7/-	6,207	1	1					in liquidation
" " " *Contrib.*				10,493 *3*	1	19/-					in liquidation
Kinta Tin Mines, Ltd	1901	£60,000	60,000	60,000	£1	£1		20% paid for 1905			13.00 sales & buyers
Kuantan Tin Mining Co., Ltd	1905	$150,000	99,000	9,900 *4*	10	10		30% paid for 1905	14.50	13.25	14.50 buyers
Pahang Corporation, Ltd	1889	£250,000	244,306	244,306 *5*	1	1	20,000	3% for year ending 30-6-02	1.75	1.60	1.60 sales
Pahang Kabang, Ltd	1890	£375,000	375,000	360,000	1	1			0.50	0.45	0.50 sales
" " " *Pref.*				15,000	1	1					nominal
Pusing Lama Tin Mines, Ltd	1904	£120,000	98,000	98,000 *6*	1	1		1/6 interim for 1906	12.00	11.65	12.00 buyers
Queensland Raub G.M.Co., Ltd. *Fully paid*	1901	£146,700	100,866	36,700	1	1					nominal
" " " " *Contrib.*				110,000	1	11/8					nominal
Raub Aust. Gold Ming. Co., Ltd. *Fully paid*	1892	£200,000	191,250	50,000	1	1	4,873	1s. paid January, '01			3.00 sellers
" " " " *Contrib.*				150,000	1	18/10		1s. " " "			3.00 sellers
Redjang Lebong Mining Co.	1898	f.2,000,000	1,800,000	18,000 *7*	100	100		32% for year ending 31-12-05			390.00 buyers
Royal Johore Tin Mining Co., Ltd	1900	$220,000	220,000	22,000	10	10		5% for year ending 15-2-04			3.25 buyers
Sipiau Tin Co., Ltd	1899	$230,000	230,000	23,000	10	10		12½% for year ending 31-12-05			6.50 sales & buyers
Tronoh Mines, Ltd	1902	£160,000	149,185	149,185 *8*	1	1		3s. interim div. for 1906	21.25	20.00	21.00 sellers
Rubber.											
Anglo-Malay Rubber Co., Ltd	1905	£150,000	140,000	140,000 *9*	1	1					£2 17s 6d
Balgownie Rubber Estate, Ltd	1905	$200,000	100,000	20,000	10	6			12.00	11.75	$12.00 sellers
Batu Caves Rubber Co., Ltd. *Fully paid*	1904	£30,000	11,125	7,000 *10*	1	1					£1 10s od.
" " " " *Contrib.*				11,000	1	7/6					£1 os. od.
Batu Unjor Rubber Co., Ltd	1905	$700,000	610,000	61,000 *11*	10	10			24.00	23.75	$24.00 sales & sellers
Bukit Rajah Rubber Co., Ltd. *Fully paid.*	1903	£70,000	59,250	54,000 *12*	1	1					£4 2s. 6d.
" " " " " *Contrib.*				7,000	1	15/-					£3 17s. 6d.
Castlewood Rubber Co., Ltd	1906	$150,000	125,000	12,500 *13*	10	10			9.75	9.00	$9.00 sellers
Cicely Rubber Estates Co., Ltd	1904	£12,000	10,500	6,000	1	1					£3 os. od.
" " " 5% Pref.				6,000	1	15/-					£2 15s. od.
Consolidated Malay Rubber Estates, Ltd	1905	£75,000	55,000	55,000 *14*	1	1					£2 3s. 3d. buyers
Ledbury Rubber Co., Ltd	1906	$250,000	225,000	22,500 *15*	10	10					$11.00 sellers
Malacca Rubber Plantations 7½% Pref.	1906	£300,000	260,625	115,000	1	1			£1.8	£1.7	£1 7s. od.
" " Ordinary *Fully paid.*				140,000	1	1			£1.5	£1.4	£1 4s. od.
" " *Contributory.*				45,000	1	2/6					nominal
Pataling Rubber Estates Syndicate, Ltd	1903	£30,000	20,000	20,000 *16*	1	1		7½% interim for 1905			£7 os. od.
Ribu Planting Co., Ltd	1904	$200,000	135,000	1,350 *17*	100	100					$270.00 sellers
Sandycroft Rubber Co., Ltd	1904	$100,000	85,000	850 *18*	100	100		10% for 1905			$260.00 sales
Selangor Rubber Co., Ltd	1898	£30,000	26,300	26,300 *19*	1	1					£8 os. od. sellers
Singapore & Johore Rubber Co., Ltd	1903	$100,000	91,500	150	100	100					$235.00 sellers
" " " " " " Contrib				850	100	90					$225.00 sellers
Sione Rubber Company, Ltd	1905	$100,000	88,000	8,800 *20*	10	10			15.00	14.50	$14.50 buyers
Sungei Way (Selangor) Rubber Co., Ltd	1904	£50,000	15,670	6,920 *21*	1	1					£2 os. od. buyers
" " " " *Contrib.*				35,000	1	7/-					£1 10s. 6d.
Vallambrosa Rubber Co., Ltd	1904	£60,000	50,000	50,000 *22*	1	1					£5 6s. od.
General.											
Bells Asbestos Eastern Agency, Ltd	1894	£5,377.10.0	£4,648.15.0	7,438	12/6	12/6		10% dividend for 1904			7.00
Fraser & Neave, Ltd	1898	$225,000	225,000	4,500	50	50	112,500	15% dividend for 1905	102.00	100.00	102.00 sales & buyers
Hogan & Co., Ltd	1904	$480,200	334,800	3,348 *23*	100	100	5,000	7% for 1904			5.00 sellers
H'kong and Shanghai Banking Corporation	1865	$10,000,000	10,000,000	80,000	125	125	10,000,000 *27* 9,500,000 *28* 250,000 *29*	35s. and 20/- bonus for ½ year ending 31-12-05			755.00 buyers
Howarth Erskine, Ltd	1901	$2,400,000	18,000	100	100						142.50 buyers
" " " 7% Pref.			6,000	100	100						112.50 buyers
Maynard & Co., Ltd	1901	$34,000	34,000	3,400	10	10		15% for year ending 31-10-05			19.00 buyers
Riley, Hargreaves & Co., Ltd	1899	$875,000	875,000	6,000	100	100	150,000	10% and 2½% bonus for year '04	120.00	115.00	115.00 sales
" " " " 7% Pref.				2,750	100	100		7% for year 1904			115.00 buyers
Singapore Cold Storage Co., Ltd	1903	$600,000	240,000	24,000 *24*	10	10					9.00 sellers
Singapore Dispensary, Ltd	1891	$30,000	30,000	600	50	50	19,000	12½% for year ending 31-7-04			67.50 sellers
Straits Ice Co., Ltd	1884	$200,000	200,000	2,000	100	100	22,000	5% interim for 1905			160.00 buyers
Straits Steam Ship Co., Ltd	1890	$500,000	421,500	5,000 *25*	100	100	400,000 169,228 *30*	10% for 1905			147.50 buyers
Straits Trading Co., Ltd	1887	$3,000,000	2,500,000	250,000 *26*	10	10	700,000 1,021,395 *31*	10% & 5% bon. ½ yr. end. 30-9-05			49.00 sales
Tanjong Pagar Dock Co., Ltd	1864	$3,700,000	3,700,000	37,000	100	100	1,950,000	$6 for half year ending 31-12-05			500.00 sales & sellers
Debentures. $											
Howarth Erskine Ltd. 6 per cent ... 600,000											2% prem. buyers
Singapore Municipal 6 " ... 400,000											3% prem. buyers
" " 5 " ... 1,878,000											par buyers
" " 4 " ... 602,300											2% dis. nominal
Riley, Hargreaves & Co., Ld. 6 p. cent 225,000											2% prem. buyers
Tanjong Pagar Dock Co., Ld. 6 " 250,000											2% prem. buyers
" " " " 5 " 1,365,500											½% prem

1 3,500 unissued
2 50,000 "
3 13,300 "
4 5,100 "
5 5,694 "
6 22,000 unissued
7 2,000 "
8 10,815 "
9 10,000 "
10 12,000 "
11 9,000 unissued
12 9,000 "
13 2,500 "
14 20,000 "
15 2,500 "
16 10,000 unissued Mort. £5,000
17 650 "
18 150 "
19 3,700 "
20 1,200 "
21 8,080 unissued
22 10,000 "
23 1,454 "
24 36,000 "
25 785 "
26 50,000 unissued
27 Special Gold Reserve Fund
28 Silver Reserve Fund
29 Insurance Fund
30 Sundry Reserves
31 Sundry Reserves

Riley, Hargreaves & Company, Ltd.

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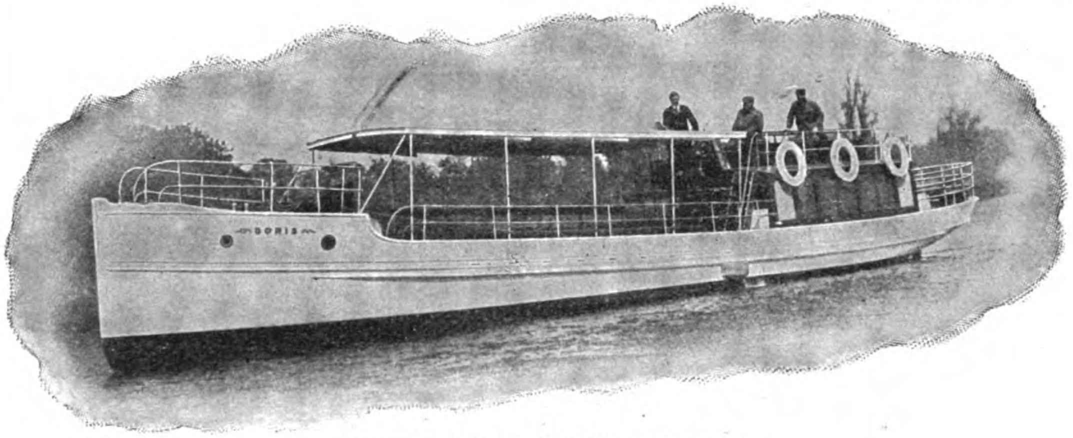

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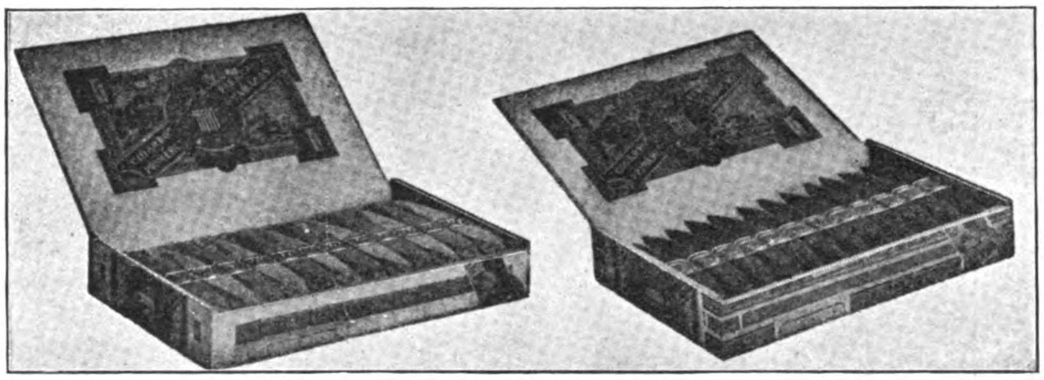

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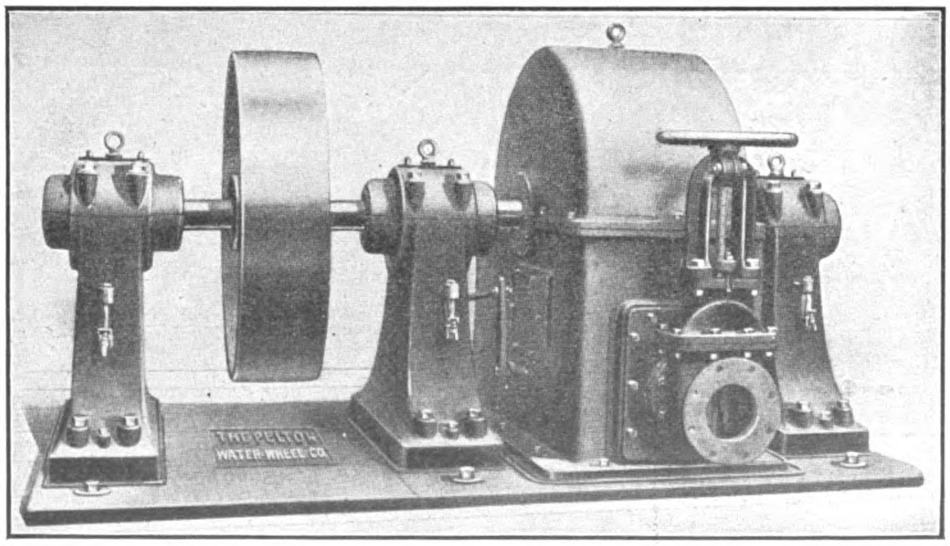

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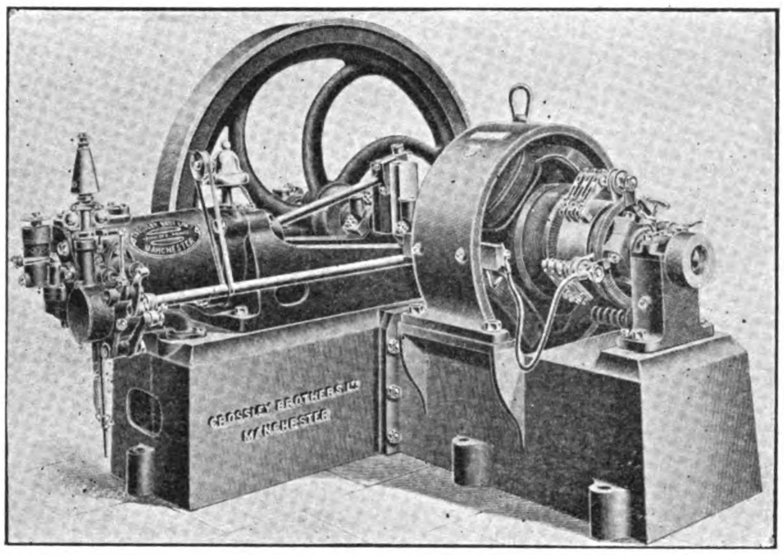

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AMOY, CHINA

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(ESTABLISHED IN 1892.)

CODES USED:
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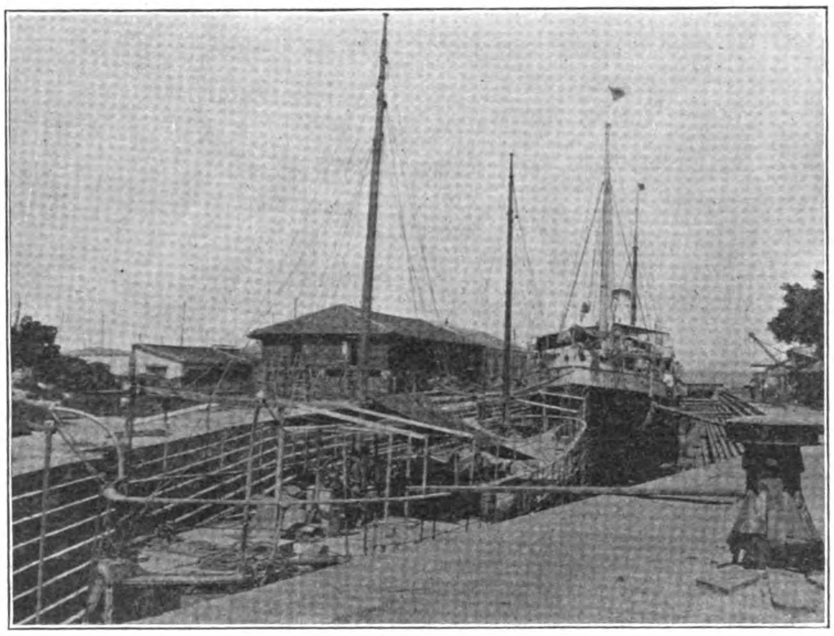
OUR GRANITE DOCK IS A TIDAL SLIPWAY AND HAS AN EXTREME LENGTH OF 360 FT., WITH A LENGTH ON BLOCKS OF 340 FT. IT CAN RECEIVE VESSELS UP TO 330 FT. BETWEEN PERPENDICULARS, 40 FT. BEAM AND A MEAN DRAFT OF 16½ FT. DURING SPRING TIDE, AND 12 FT. DURING NEAPS : : : : : : : :

THE MOST CONVENIENT AND SATISFACTORY DOCK FOR PHILIPPINE SHIPOWNERS, ON ACCOUNT OF LOCATION AND DISTANCE : : : : : : :



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OUTPUT AND SALES

1,000,000 TONS PER ANNUM
CARGOES DELIVERED BY
COMPANY'S OWN STEAMERS
TO ANY PORT IN THE FAR EAST

THE COMPANY HAS

FACILITIES FOR LOADING COAL AT THE ICE FREE PORT OF CHIN-WANG-TAO, WITH WHICH IT IS IN RAILWAY COMMUNICATION

THE IMPERIAL RAILWAYS OF NORTH CHINA AND THE LUHAN RAILWAY USE THIS COAL FOR THEIR LOCOMOTIVES, AND AN EXTENSIVE BUNKERING BUSINESS IS DONE WITH STEAMERS

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TONGSHAN CEMENT-WORKS, NORTH-CHINA
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TONGSHAN PORTLAND CEMENT

IS MANUFACTURED FROM THE BEST RAW MATERIALS BY COMPLETE AND MODERN MACHINERY UNDER EXPERT SUPERVISION. UNIVERSALLY USED THROUGHOUT NORTH CHINA AND HAS SECURED THE HIGHEST APPROVAL FOR ITS GOOD QUALITY, CONSTANCY OF VOLUME AND FINENESS : :

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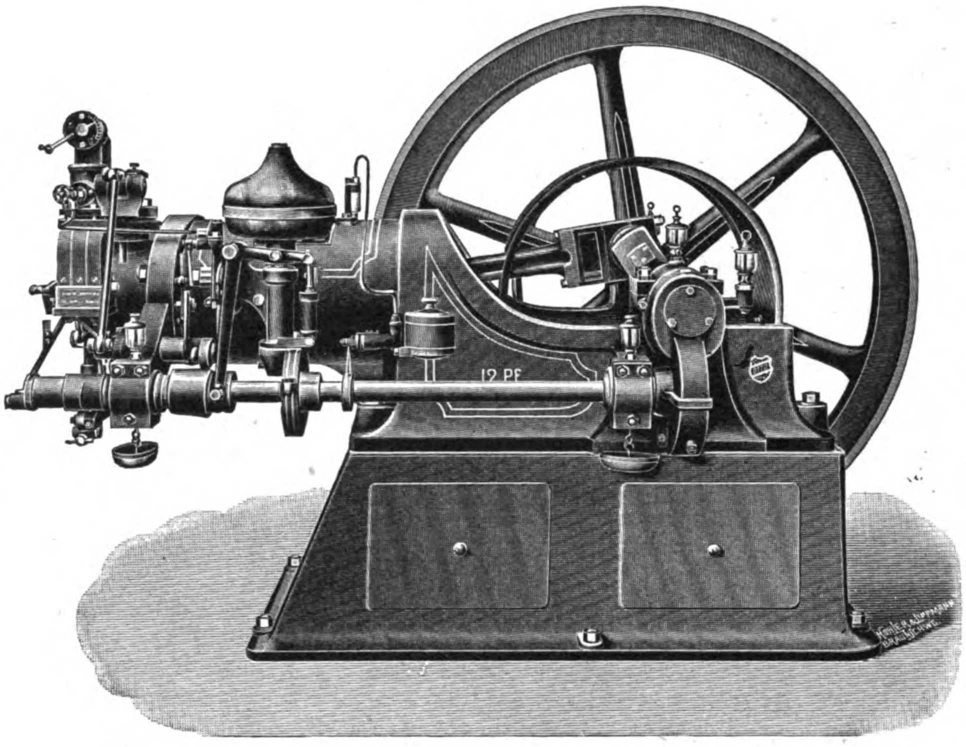

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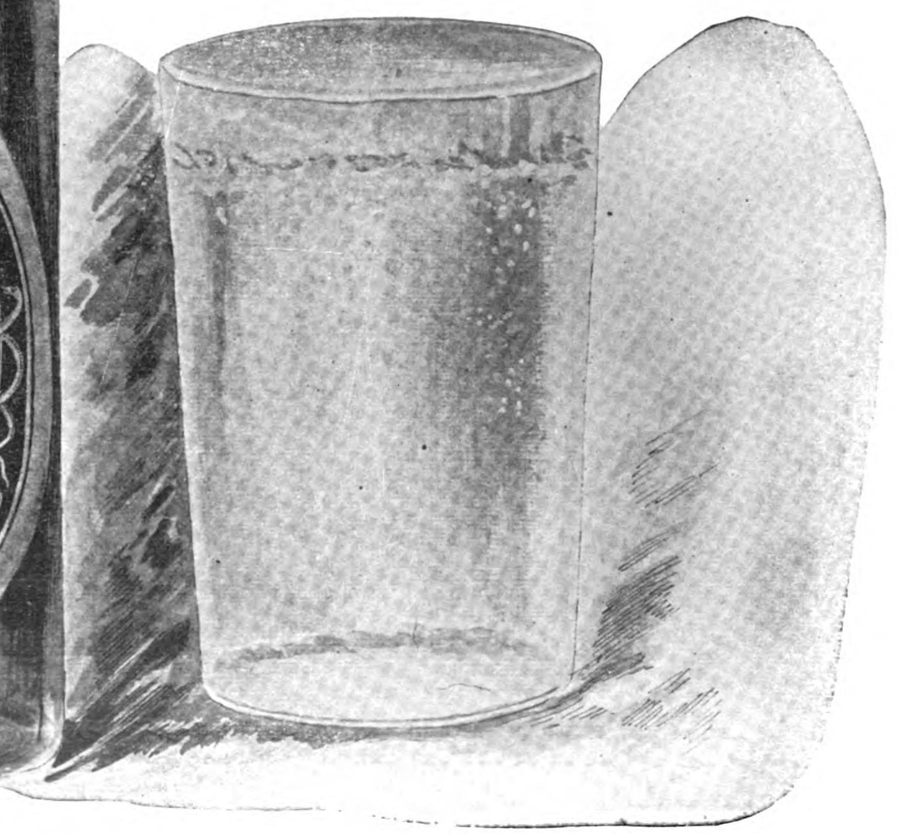
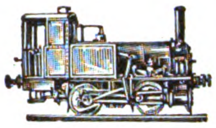
MANILA.





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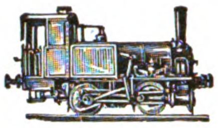

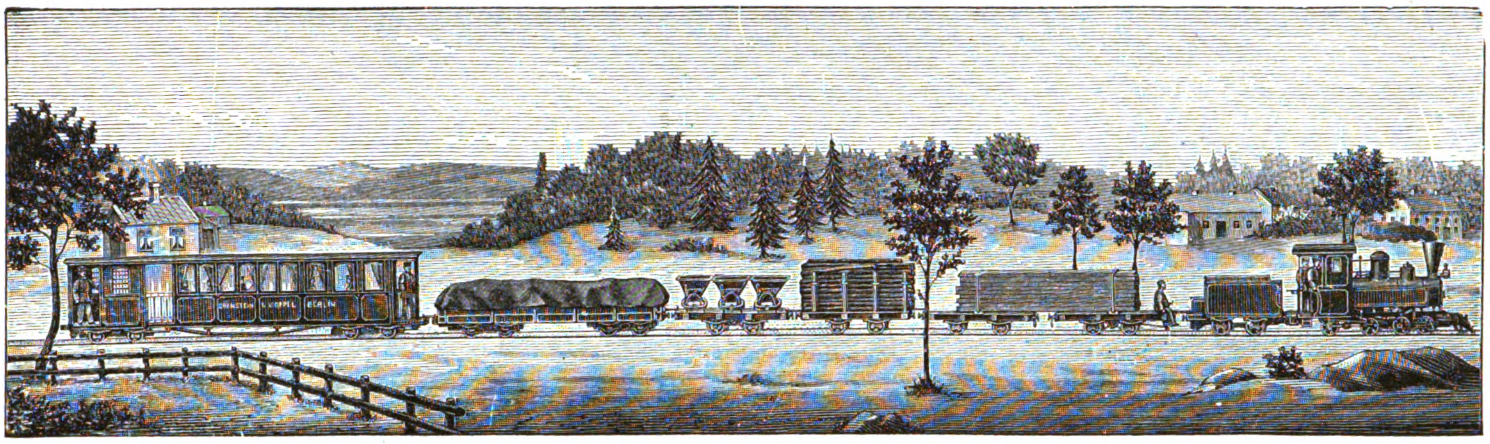

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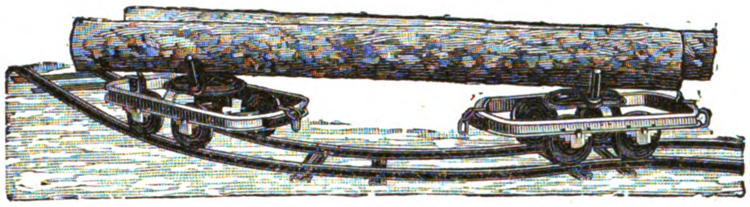

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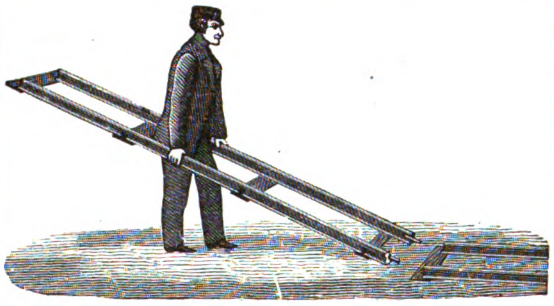

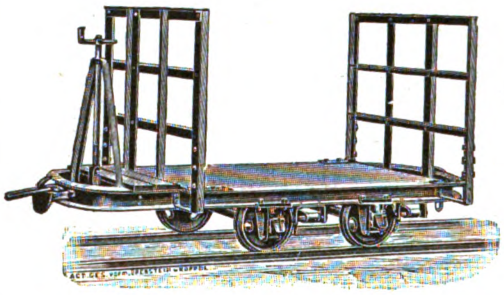

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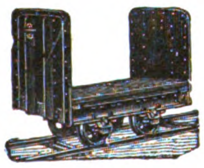

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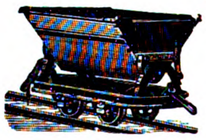

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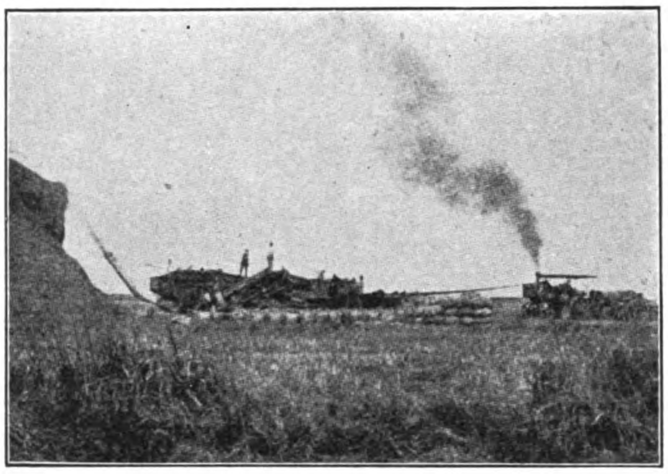

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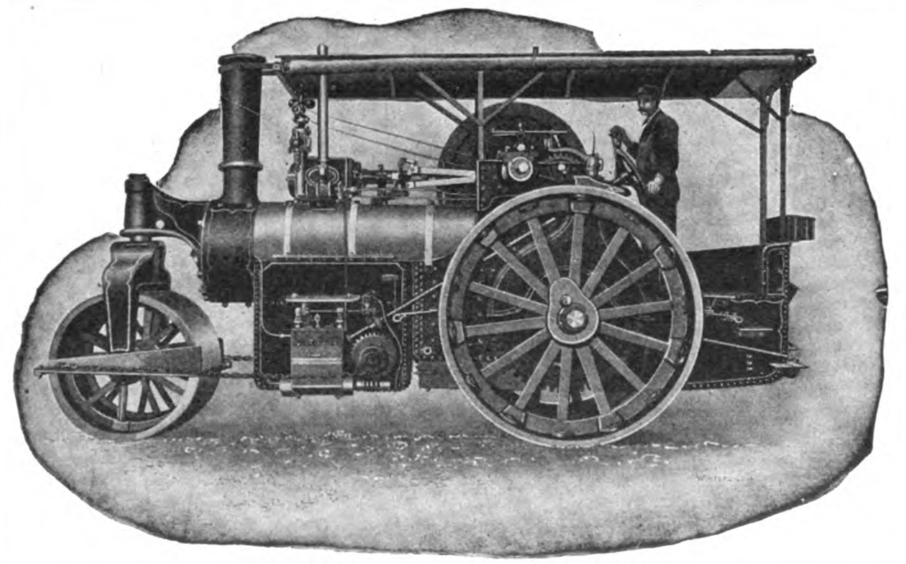

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THE FAR EASTERN REVIEW

COMMERCE ✿ ENGINEERING ✿ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, JULY, 1906. No. 2.

GENERAL INSTRUCTIONS FOR LOCATING ENGINEERS

(By E. J. BEARD, C. E., Chief Engineer, Philippine Railway Company.)

The general instructions to the engineers engaged on the surveys of the routes in the islands of Panay, Cebu and Negros, Philippine Islands, for the proposed system of the Philippine Railway Company, issued recently by Mr. E. J. Beard, C. E., chief engineer, are quite likely to prove of great general interest to those members of the profession who are studying or carrying on railway construction work throughout the Orient. The chief engineer deals concisely with all features of the problem. He condenses into a most readable circular all of the best features of modern railway surveys, in addition to which he includes many excellent ideas of his own which have been developed by long practical experience in this particular branch of civil engineering. The instructions are accompanied with drawings which illustrate the most important branches of the work, and are as follows:—

Sec. 1.—Chiefs of locating parties and their subordinates will be guided by the following letter of instructions, to be supplemented from time to time by such additional instructions as may seem necessary. Chiefs of party are requested that, on receipt of such supplementals, they attach them to this letter and keep the whole on file in their office accessible to all employees and other parties concerned.

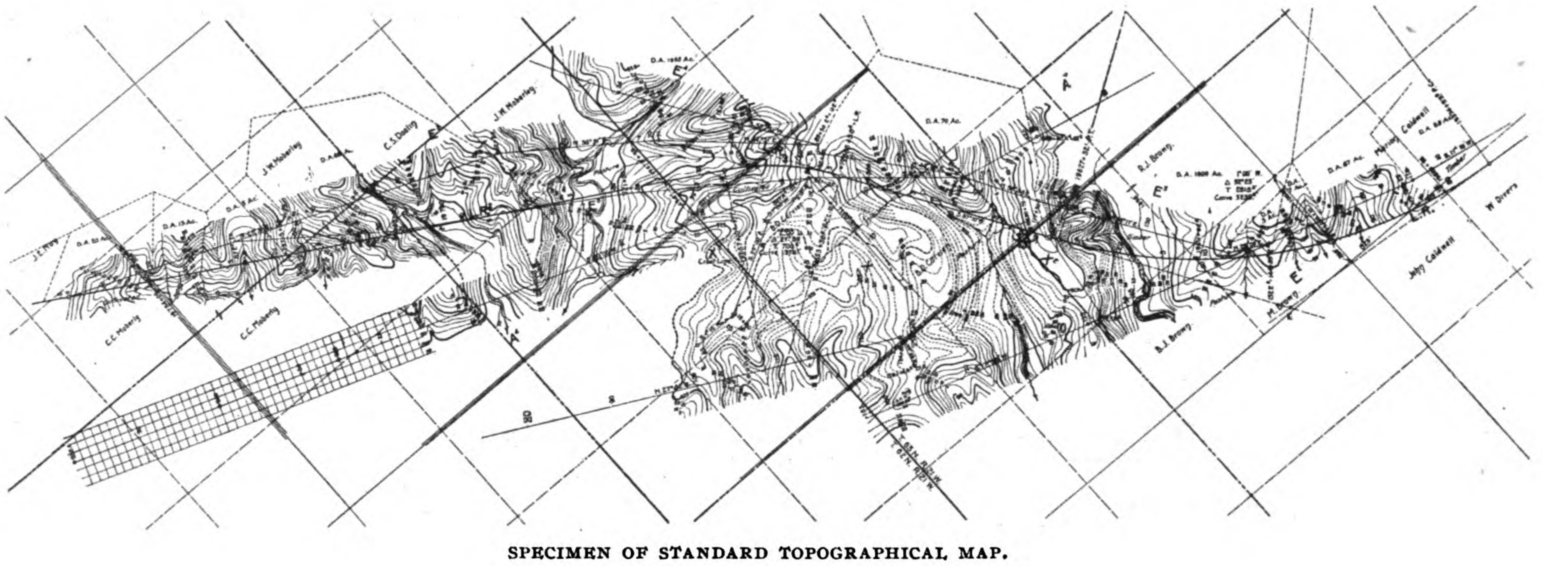
Sec. 2.—Chiefs of party are expected to see that their parties are sufficiently supplied with instruments, tents, stationery, provisions, and all other tools and outfits needed for the proper and vigorous prosecution of their work. They will be held responsible for the competency and sobriety of each member of the party. They will see that instruments are kept in adjustment, and all possible checks are made on the accuracy of the work.

Sec. 3.—The determination of the maximum curve and ruling grade depends on what the preliminary surveys develop; the least rate of each is desired consistent with all the conditions imposed by density of traffic and cost to obtain, and as rapidly as these factors are ascertained for each line they will be determined by the chief engineer; until such time, it is the duty of each chief of party to show his ability in that direction.

Sec. 4.—Topography will be taken 300′ on each side of all preliminary lines, and, after being plotted, the best location obtainable within this field of topography projected on the map, hence the preliminary lines are, as a matter of fact, merely base lines from which to secure the topography of a 600′ belt of country, within which it is expected the proper location will lie; therefore, no expenditure in time cost should be made to have the preliminary lines lie along the final location. At the same time, skill should be employed and will be shown by placing them as near the finally determined location as possible, for the system of taking topography required diminishes its accuracy the farther it lies from the preliminary line. Parallel preliminary lines within 400 feet of each other, or the backing up of a line to place it within that limit, are unnecessary and here considered bad practice.

On preliminary lines all important streams will be meandered for some distance above and below the crossing of the line. This meander line can be frequently run up the bed of the stream and both banks located from one line by off-sets.

Sec. 5.—The 300′ of topography—to be taken on each side of all preliminary lines, as per *Sec. 4*, will be taken their full length and shown in field notes by 5′ contours; to be taken in the field with a hand level, considering the topographer's eye as always 5′ above the ground. The use of a 5′ stick on which to rest the level is prohibited. Usually distances out will be obtained by stepping, and taping in is only necessary on very steep slopes. The topographer will sketch, in all topography taken in the field, to a scale of 100′ to the inch, on standard cross-section sheets 6″×8″, or in a standard cross-section book. Topographers will take care to obtain sufficient information at the angles in the line to properly connect contours on the office map. It is suggested that the topographers work one day behind the level party, when each evening they can take station and plus of every 5′ contour crossing, directly from the preliminary profile, then, when in the field, they can readily start off the centre line with their feet on a contour where it crosses, thereby simplifying their work.



SPECIMEN OF STANDARD TOPOGRAPHICAL MAP.

Reduced from an original 400-foot map.

The topographer must obtain all improvements within the belt of topography being taken, and, in case of buildings, note their approximate value. He will note the station where the line leaves timber land and enters cultivated land, and vice versa. The distance to buildings from preliminary lines should be stepped and recorded to the two corners of the long side towards the line, and these two distances taken at right angles to the preliminary line, giving the station of each.

If the topographer is unable to keep up with the progress of the party it will be found good practice, before moving camp, to break the entire party into small topographical squads and bring the work up to date. This tends to school all the men in the art of taking topography.

(Continued on page 37.)

THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.
PUBLISHER AND EDITOR

COMMERCE :-: ENGINEERING :-: FINANCE

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MANILA, SHANGHAI AND YOKOHAMA, JULY 1906

JAPAN'S MANCHURIAN POLICY.

We publish elsewhere in our columns the full text of the Imperial Japanese Ordinance creating the Chino-Japanese Development Co., Ltd., for operating in Southern Manchuria. The document is a powerful argument in support of the persistent contention that Japan is not sincere in her oft repeated declarations that the province of Manchuria will be thrown open to the trade of the world, and when we further absorb the true significance attached to the amalgamation of the cotton piece goods manufacturers in Japan, it is hard to see how any explanation can clear away the above impression.

Japan may be acting in entirely good faith, in fact we have her oft repeated assurances to this effect, but nevertheless actions speak louder than words, and indicate the trend of her policy more effectively than studied diplomatic phrases.

The Chino-Japanese Development Company is a misnomer,—a blind to disguise the true standing of the enterprise. The government appoints all the officers, fixes their salaries and holds the power of removal. No foreigner can hold shares in the enterprise, indicating the purpose of a cast iron monopoly for a favored few. In fact it is merely a thinly disguised department of the Imperial Government, on the lines of the many semi-official enterprises of the empire.

The official programme mapped out for the control of South Manchuria, as indicated in the provisions referred to, is exposed to the lime light of publicity by the immediate campaign of the cotton goods manufacturers to seize the markets for Japan. After forming a guild for the exploitation of this market, naming the Mitsui Bussan Kaisha as their selling agents, the five textile companies appealed to the government for a loan of 6,000,000 yen, and for the free transportation on the Japanese controlled railway in Manchuria, or at least half rates, and a further demand of a half reduction on the ocean freights of the Japanese subsidized lines.

How this propaganda is consistent with the polite assurances of good faith it is difficult to conceive.

GRAFT IN CEYLON

According to the London *Truth* a huge political "graft" has been discovered in connection with the Pearl Fisheries of Ceylon, one of the principal sources of revenue for the Colony. It seems that up to 1902 the industry was carried on in an unscientific and wasteful manner, when the Governor of Ceylon, Sir West Ridgeway, engaged an expert to make a thorough study and report on the fishery. The result was that certain laws were enacted, which increased the revenues from this source, rising to Rs. 8,29,348 in 1903, and a further increase of two lakhs and a half the following year, while last year the revenues rose to Rs. 25 lakhs.

It is charged that shortly after his retirement from the governorship of Ceylon, which took place in 1903, Sir West Ridgeway formed a syndicate and suceeded in inducing Mr. Lyttelton, the late Colonial Secretary, to grant a lease of the fisheries to the syndicate for a term of twenty years, at a rent of Rs. 3,10,000 per annum. Or, in other words, the syndicate was to pocket annually a sum of not less than twenty lakhs and the Ceylon Government was to get only three lakhs!

Truth says that it is as patent as the sun at mid-day that Sir West Ridgeway had made use of information, which he had derived in his official capacity as Governor of Ceylon, in order to rob the Ceylon Government to the tune of twenty lakhs per annum and to enrich the syndicate, which he had formed and of which he is perhaps the most important member.

This means diverting about $650,000 gold into the pockets of the syndicate, at the expense of the Ceylon taxpayer, and, as an example of high class crookedness, is on a parallel with the recent land frauds in the United States, which resulted in the conviction of one of the Senate. We wonder whether his Excellency Sir West Ridgeway will be called upon to explain.

FILIPINO LABOR FOR HAWAII

One of the main arguments in opposition advanced by the beet sugar lobbyists in the hearings before the House and Senate Committees on the Tariff Bill, was based on the alleged enormous available labor supply of the Islands, and the miserable wage of six cents per day at which it could be employed. This phase of the argument assumed considerable importance in estimating the future cost of production and the final cost of sugar laid down at the competing point of the Missouri River. To offset this, it was necessary to prove that granting the existence of this great supply, it could not be moved around and made available. On this point Mr. Rea made the following pointed remarks:—

"Our friends of the opposition, who are so worried over the future of the poor Filipino, who express such benevolent and altruistic views for his emancipation, and who see over there in jungles of those far-away islands millions of future serfs for the cane-sugar barons, why don't they put into practice what they preach? If they are in earnest about their salvation, why don't they go over and secure a few thousand to work their beet fields and release our own race from the degrading yoke? There is no law that I know of against the importation of Filipino labor, so the altruistic beet, the enterprising Hawaiian, and Louisiana planter can surely have no objection nor find any difficulty in solving their troubles. They say the labor is there in abundance, despite all that others have said to the contrary. All right, I answer, more power to you, go and get them; you need them in your business. Why don't they try? We have tried. We have tried to induce them to go from one province to another and fialed. We have shown those who were starving in Cebu that they could earn $2 gold per day in the hemp fields of Sorsogon; we have offered two months' pay in advance to entice the Tao from his nipa shack in Capiz to the cane fields of Negros; we have sent out men in the provinces of Pangasinan, Isabela, Nueva Ecija, and Pampanga to enlist laborers for the Benguet road, and we have failed to budge him away from his guitar and his vino. But we don't know anything over there. We Americans are not up to the ways of the natives. No, only the American beet sugar men know what they are talking about; they know better; they can do what we failed to do. Well, there's the islands, there's the labor, and here's the demand. Why don't they try? Mr. Hatch, representing the Hawaiian planters, when asked the question, condescended to honor us who know by stating the Filipino would not leave home. We told him that—he don't know it from his own knowledge. Let him try.

Maybe, gentlemen, the future will show that we, exiled Americans in the far-away islands, know what we are talking about."

It had been previously pointed out that the main deterrent factor to the development of the sugar indnstry in Hawaii, Louisiana and the American beet fields was the lack of cheap and efficient labor. The Hawaiians had turned as a last resort to the introduction of labor from Europe. They had already experimented with all kinds of cheap and coolie labor, embracing Kanakas, Chinese, Koreans, Japanese, Portuguese, Porto Ricans, Russians, and some Malays, but could not succeed in keeping a full supply at work.

It would appear that the suggestion of Mr. Rea was immediately grasped by the Hawaiian Planters' Association for within a month after the publication of the Hearings, we find that they had determined to experiment with Filipino labor, appointing Albert F. Judd, a young lawyer of prominence, and cousin of Governor Carter, as their commissioner to go to the Philippines.

Notwithstanding the statements made that the Filipino is not a very good laborer, that he is not inclined to labor consecutively, and that the Philippines need the Chinese as laborers, the Hawaiian planters, after considerable investigating, came to the conclusion that the Filipino can be made an important element in their supply of labor. They believe that, separated from his accustomed surroundings, where the habits of life and customs of centuries conduce to a low standard of living, in which there is no incentive either to large earning capacity or to thrift, and placed in new surroundings where he will be in contact with a new and higher plane of living, he will acquire habits of more continuous industry and thrift.

Mr. Judd has since reached the Islands and is endeavoring to secure 200 families as an experiment, but has met with opposition from some of the native papers who are concerned about the preservation of the Filipino soul and advise their countrymen against accepting his overtures. In this they are again delaying the future happiness and prosperity of the people they are attempting to represent.

As indicated in the testimony of Mr. Rea before the Senate Committee, one of the greatest difficulties to be faced in the future development of the Philippine sugar industry, is the absolute lack of skilled labor and mechanics conversant with modern methods. Under our present laws, a new company would be forced to the necessity of importing their skilled help for a long time from other sugar producing centers under the flag, or from Hawaii, Louisiana or Porto Rico, at a higher salary and passage guaranteed both ways, thus greatly increasing the cost of production.

Modern methods of cultivation and manufacture are unknown in the Islands, and it will take years to educate the native up to the standard required.

We have an abiding faith in the ultimate passage of the Tariff Bill, and sooner or later justice will be accorded the Islands. It may be delayed for a year or so, but its final passage must come if we are to retain control of the Islands. After its enactment into law, it will take at least three years for

new enterprises to take off the first crop, or some five years hence before the advantages of the Bill would be apparent, granting its passage this next session.

The needs of the Hawaiians, even though they opposed our Bill, might with proper regulations be turned into profit for the future advancement of the Insular industry, and harmonize with the policy of the administration of the Philippines for the natives.

The Hawaiians need plantation hands; two hundred families would not impair the labor supply of the Islands. Pending the passage of the Tariff Bill, and the ensuing period before modern factories could get to work, it would seem that our future industrial interests could be advanced if the Government could officially indorse this movement, and regulate the system by certain provisos that would redound to our own benefit.

For instance, the Insular Government could sanction the exportation of a limited number of Filipinos for work in the Hawaiian plantations, on the condition that a certain percentage, say one out of every five, be apprenticed to work in the various positions in the sugar house, so as to learn the manipulation of the many new machines employed in the process of manufacture, and that a similar proportion be accorded equal opportunities in the fields.

In the course of two or three years there would be created a force of intelligent sugar house employees, fully understanding the duties required of them. If by that time the Tariff Bill has become a law, and capital induced to enter the Philippines there will be a supply of skilled mechanics and help to draw upon, who would be only too willing to return to their native land under similar employment and wages, and would be the nucleus to instruct and train other natives for the future requirements of the growing industry, thus obviating the alternative of importing outside help. This fact would be an added incentive for capital to invest more rapidly in the Islands.

If there is no restriction on the emigration of Filipino labor to other parts of the United States, the Hawaiians will be to a certain extent successful in their undertaking, as there is no law to prohibit them, and to achieve the most benefit to the Islands from what they do succeed in doing, the foregoing suggestion is worth consideration. An inspector could be appointed by the Insular Government to reside in Hawaii and see that the terms of the contract were duly carried out.

FAR EASTERN DOCKS

Commercial Intelligence publishes an interesting article on the docks and shipbuilding of the Far East, and, after a long description of and praise for the Japanese yards, has the following to say anent the British enterprises of the mainland.

"A striking fact about the Japanese shipbuilding and dock concerns is that they are all capable of accepting and carrying out building contracts of considerable magnitude, which is not the case with any other concern anywhere East of Port Said. Of course, they have to import a considerable amount of their material, but so have the others. There appears to be considerably more technical knowledge and skill in the private yards of Japan than in any of the concerns working in the British possessions of the East or in China. What is more, the class of material purchased in Great Britain by the Japanese yards is far higher than is the case with similar concerns at either Singapore, Hongkong or Shanghai.

In view of these facts, it is difficult to see anything bright in the prospects of those dock companies working in the Hongkong or Shanghai, and I must again very strongly advise British investors to abstain from providing capital for any such concern that is likely to be offered in London."

There is an evident bias in the above remarks and an unfair reflection on the skill and knowledge of the technical staff of the British concerns. That a Britisher should voice the opinion that there is more technical knowledge and skill in the private yards of Japan than in the establishments at Singapore, Hongkong, or Shanghai, shows to what extent some English writers will slop over in their fulsome praise and adulation of their allies. When we remember that Britain has excelled the world in shipbuilding, and some of her best men have created the industry in the Far East and have brought it to its present prominence, the reflection on such engineers as Dixon, Nicholsen, Danby, Wilson, Twentyman, and others is decidedly uncalled for. It is quite evident that the writer has assumed this superiority of the Japanese over his own countrymen, on the fact that the Japanese yards have turned out and equipped some larger ships than the other yards of the East.

His is merely a circumstance of accident and location, where the Japanese Government have purposely encouraged the building of certain vessels in her own yards under the supervision of her foreign trained shipbuilders. While admitting the imitative skill of the latter, we cannot indorse any opinion which places them in a superior position to the type of British Engineers who have managed the other enterprises in the Far East. If these had the same opportunity to build the larger ships, there is no doubt about their ability to carry out the contract successfully and with superior intelligence.

As to the class of material purchased for Japan being better than that supplied to the other Far Eastern companies, it follows naturally after the above explanation that the Japanese have been ordering higher grade materials for the construction of the many war vessels now under contract. The majority of this work could have successfully been carried out by two or three concerns on the China Coast, if political influences had not sent the orders to Japan, in which event the statement would have been reversed.

There is one point, however, in the article referred to, which bears considerable weight, and though it smacks of stock jobbing or an attempt to "bear" the shares of the Coast concerns, the statement has some foundation.

"It is difficult to see anything bright in the prospects of those dock companies working in Hongkong or Shanghai," states our contemporary, and, as a matter of cold fact which has to be faced, the truth of it is apparent.

No other industrial enterprise has experienced such a boom in this part of the world, as docking and shipbuilding. In regard to the docks at Hongkong, where up to the present they have had a complete monopoly, they must shortly face a severe competition. The completion of the big Admiralty Dock will divert the docking and repairing of British naval vessels; the immense new dock at Quarry Bay will make further inroads on their old business, and the arrival at Manila of the big floating dock "Dewey" will keep American naval vessels away from the coast. In Shanghai, during the past year, the Kiangnan Arsenal dock has been converted into a commercial enterprise entering as a stiff competitor for the work at that port, formerly monopolized by Farnham, Boyd & Co., and now the Japanese Kawasaki Dock Company has publicly stated its intention to also establish works at that port.

The Mitsu Bishi, Kawasaki, Uraga and Yokohama Dock Companies, the Osaka Iron Works and other smaller concerns in Japan are all reaching out, and advertising for business in China and the Far East, and evidently mean to get it.

In addition to the larger enterprises on the China Coast at Hongkong, Shanghai and Singapore, all the secondary ports now have their own docks and shops for handling the local and coast trade.

With the entrance of the Japanese into the field, adopting modern pushing business methods, and a determination to succed, it behooves the older firms in the mainland to throw off some of their insular conservatism and face the issue, fighting the competition with their own tactics. Otherwise, the inevitable loss of business, and consequent shrinkage of dividends and value of their stock will follow.

The correspondent of the *Commercial Intelligence* has evidently had this in mind, in warning home investors against providing capital for docking enterprises in the Far East.

SHIPBUILDING IN MANILA

Elsewhere in our columns we publish the description and views of an old established shipbuilding and engineering concern, and in future issues we will also devote space to similar enterprises of the Islands. All that is needed to resurrect this important industry is adequate patronage and assistance from our home interests.

There is little doubt but that with some adequate protection, a flourishing industry would develop in Manila, from the now struggling engineering enterprises like the Varadero, San Nicolas Iron Works, Manuel Earnshaw & Co., and others, but with the present tendency and policy of the authorities which permit this work to go to foreign ports, they must eventually perish.

The great increase in wages since the American occupation—apparent in all branches of industry—and the high tariff charges increasing the value of material, practically prohibit any competition with the China coast shipbuilding firms, enjoying the double advantage of free material and coolie labor. In Hongkong, a good boilermaker, commands a daily wage of seventy cents mexican, while here in Manila, the same Chinese mechanic refuses to work for less than ₱4.00 to ₱4.50. The laws in force prohibit the importation of Chinese laborers or mechanics, so there is no remedy for the high wages imposed on the local enterprise.

Our laws are so constructed that, with the high tariff and exclusion, local firms cannot compete, and, while there appears to be sufficient justification for their application as they stand, there is certainly no justification or excuse for the conditions which permit an apparent evasion of the law. We impose the tariff for revenue and exclusion for the protection of the native worker, but we ignore the provisions of these measures by permitting vessels to proceed to Hongkong for their repairs, where the owners receive the benefit of the tariff and the cheap labor, and return to this their home port free of any charges. The government is cheated out of its lawful revenue which would otherwise have accrued to the Treasury, and the engineering firms who pay their quota of the taxes are deprived of the work and incidental profits on which they exist. Firms who invest their capital in such enterprises in Manila naturally hope to secure the local patronage, otherwise they might just as well locate in Hongkong and help swell the treasury of that colony with their taxes.

This phase of our industrial situation is one demanding immediate attention and some scheme devised to foster our own enterprises. The Government should take the matter under prompt consideration as a means of saving and developing an important source of revenue.

Conditions which permit local firms to contract for several wooden lighters for the use of the U. S. Navy and then sublet them to foreign companies, where cheap labor and free material are available, demand immediate attention. The Government itself has taken the lead in diverting this great business to foreign ports. Estimates are asked from local firms, and at the same time they are informed that they will have to compete with foreign firms.

If the finished foreign product enters free of duty, how on earth can the local firm, who pays the duty and his taxes hope to underbid such competition. How can a vessel built in a foreign port legally float the United States flag?

In all fairness and equity, the local yards should be given an opportunity to develop. With the assurance of protection, the plants would be immediately enlarged and brought up to a plane where they could cope with more important work and gradually establish an independence from foreign competition. As it is, without this protection, they are afraid to invest capital in improvements which would mean a total loss if conditions are unchanged. This attitude is entirely justifiable from their standpoint, as a result of past experience, for in prospect of securing the orders for the construction of the

Coast Guard cutters, the Varadero spent ₱15,000 in a new shear and punching machine. As the bids from China and Japan were accepted, this investment represented almost a total loss, as the class of work remaining for them to pick up did not necessitate the use of such large and expensive machine tools.

Protect and help our local firms, and it will give an impetus to other lines of industry. We need the money here. The Government needs its revenues, the engineering firms need the business to save them from being wiped out, and the allied commercial interests all need their quota of the golden stream, which flows steadily over to China.

Keep it here!

UNITED STATES COURT FOR CHINA

The appointment of the Hon. Lebbeus R. Wilfley to the position of Judge of the United States Court for China comes as a distinct surprise to many in the Far East, but must meet with universal approval. The necessity of creating this post and relieving the arduous duties of our Consul General at Shanghai, has been urged by all the American interests of the East for some time, and it is a distinct recognition of the growing importance of our influence in the Far East that a jurist of the high standing of Mr. Wilfley has received the first appointment.

The post was created under the provisions of our new Consular Bill, and carries with it a tenure of office of 10 years, and a salary of $8,000.00 gold, with an allowance of $10.00 per day travelling expenses. The Court has original jurisdiction in all cases now tried before the American Consuls in China, except small civil and criminal cases which are still under the jurisdiction of the consular courts, but having the right of appeal to the United States Court at Shanghai. The Court will sit at Canton, Hankow, Tientsin, Pekin, Chefoo and other Consular ports as cases demand.

In his official capacity as Attorney-General of the Philippines, Mr. Wilfley has gained the confidence and approval of the Administration, and it was on the recommendation of the Honorable Secretary of War that the President and Secretary Root offered him the post by cable.

"WHO'S WHO IN THE FAR EAST"

We have received from the publishers a book with the above title, and welcome it as a valuable addition to our reference library. Compiled on the lines of the older and standard works of the same nature, the present production, covering as it does all the notabilities of the Far East, including the prominent Chinese and Japanese officials and men of note, it deserves commendation. The failure to include references to Americans in the Philippines will undoubtedly be remedied in the following succeeding issues.

Who's Who in the Far East, published by THE CHINA MAIL, Hongkong. Price $10.00 (silver) net.

JAPANESE OFFICIAL INTERFERENCE IN PRIVATE BUSINESS.

The *Moji Shimpo* has an article in which it condemns the growing tendency on the part of the Government to interfere in private enterprises. The evils of bureaucracy have long been existing in Japanese official circles, says the journal, and in the desire to extend their influence the officials are making pernicious interference in private business affairs. This tendency has been more marked in connection with the Department of Finance, which, owing to the peculiar nature of its business, has been comparatively free from outside influence. Thus, the monopoly of tobacco and salt has been carried out regardless of the decline of private business, and endeavors are also being made to apply similar measures in respect to other trade. These measures, though carried out ostensibly for financial reasons, are, as a matter of fact, aimed at the extension of official authority. When a revision of the Bank regulations is mooted

(Continued on page 50)

SIAM STATE RAILWAYS

Opening of Tenders.—The Royal Railway Department is this year calling for tenders for a quantity of rolling stock, amounting to 339 vehicles with spare parts. The tenders for ballast waggons (items 15 and 16) were publicly opened this morning at the head office of the Department in Bangkok. The Director-General, Mr. L. Weiler, opened the tenders in the presence of representatives of the Bangkok firms that had tendered, and others. Item 15 was 100 ballast waggons without brakes and item 16 was 20 ballast waggons with brakes. These have to be delivered in Bangkok in 10 months after the order is given. The tenders were opened in the following order, the prices being per waggon in £ sterling:—

	Item 15	Item 16
A Diana & Co., Bangkok.	108	120
Usine de Brainc-le Comte, Belgium	113	137.10
Nesselsdorfer Wagenbu Fabrik Gesselschaft, Vienna,	108	132
E Bock, Bangkok	105	128.10
Denny Mott & Dickson Ltd. Bangkok, for the Metropolitan Amalgamated Railway Carriage and Wagon Co. Ltd., Oldbury, England	174.14.7	197-19.2
G. Kluzer & Co., Bangkok	122. 4	158. 1
B Grimm & Co., Bangkok	164	191
Windsor & Co., Bangkok, for Van der Zypen und Charlier, Koln	124	141
Clark & Co., Bangkok	187. 2.3	211. 7.3
Clarke & Co., Bangkok, for Société Anonyme Franco-Belge La Croyee	117. 7.6	138. 3.6
Howarth Erskine Ltd., Bangkok	130.12.6	148.10.6
(For ordinary steel prices to be reduced £12 per waggon)		
Soc. Anon. des Ateliers Germain Monceau, Sambre, Belgium,	130. 4	151.13
Soc. l'Industrie Soc. Anon., Luvian, Belgium	115.14	131.18
Baume et Marpent, Haine-St. Pierre, Belgium	139	159
do. (But with the quality of steel specified for the Belgium State Railway	127	147
Les Ateliers du Boeulx, Belgium	121	140
Slaudinger Wagon Fabrik, Vienna	124. 6	145. 6
Huret Nelson & Co., Ltd., Motherwell	135	160

By Telegram

Kalt Weiss, Siegen, Germany	130	150
Les Ateliers. Métallurgiques, Brussels	128	145
From England, telegram unintelligible	—	—
Nederlandsche Fabrik von Werktuijen und Spoorwej, Amsterdam	140	165
Dick Kerr & Co., Ltd., London	205	227
Mendelson, Tokyo	255	280
Forge, Leeds	154	197
American Car Foundry Co., New York	171	no price
Brnsh Electrical Engineering Co., Ltd., London	126	146
Nesselsdorfer Wagenbau Fabrik Gesselschaft	120	150

There are thus tenders from seven Belgian firms, seven British, three Austrian, three German, two Italian, one Dutch, one Japanese, and one American.

The lowest tender would thus be that of Mr. E. Bock, £13,070; and the next that of Messrs. A. Diana and Co., £13,200. The highest runs to £31,100.

COTTON MILLS AT SHANGHAI.

Mr. Jotaro Yamanoto, acting director of the Mitsui and Co., states in the *Chugai Shogyo*, about the cotton mill sat Shanghai, as follows:—

The cotton mill business in Shanghai is making a fair progress. At present the spindles in Shanghai number about 300,000, of which 100,000 are owned by the Chinese, 100,000 by the English, 50,000 by the Japanese and 40,000 by the Germans. The cotton mills are representative of the different countries' business interests in China, in regard not only to cotton mill business alone, but to industry in general. Judged from the results of investigations carried out in the past four or five years, the cotton mills worked by the Japanese compare favorably with those of other nationalities. As a cause of the superiority, it may be said that the community of letters used by the Japanese and Chinese and the similarity of their thoughts in the main, make it easier for the former to control the Chinese operatives than for other nationals. We have been in consequence able to dispense with compradores and save their commissions. Our concerns therefore have succeeded to pay a handsome amount of dividends and to set aside reserve funds, while almost all those belonging to other nationals had to go without paying any dividends since the establishment of their concerns.

It is again an undeniable fact that the Chinese have come to recognize the industrial ability of the Japanese. Of late they have been scheming to organize three or four cotton mills, and it is the uniform desire of promoters to engage Japanese engineers and experts for their factories. A similar tendency is to be observed in connection with other industrial enterprises taken up by the Chinese.

The sorts of cotton yarns demanded in China are varied. Manchuria demands 10-hand, Shanghai 14-hand, Tientsin and Chefoo 16-hand, and Szechuan 20-hand, while India supplies 10-hand and 20-hand and China 14-hand. Cotton yarns made in Japan sold well this year.

The sale of cotton yarns varies according to their sorts and to the places where they are sold. Formerly Japanese yarns were quoted below or equal to Indian yarns. At present, however, the Chinese have come to admit the superiority of our yarns in quality. They are therefore quoted five or six taels above Indian yarns. At Tientsin, Chefoo, and Hankow, our 16-hand yarns, dearer as they are than Indian yarns, can command the market. But Szechuan prefers inferior and cheaper 20-hand sort. It is, however, desirable that our cotton mills should strive to maintain the good quality of their yarns.

The trade in general at Shanghai is most active at present. The large sum of money spent there by the late belligerents have greatly increased the purchasing power of the Chinese. A large amount of cotton yarns and cotton goods was exported from Japan to Shanghai during the war, and it is quite reasonable to expect that the trade will continue to prosper for the future.

THE ANGLO-JAPANESE BANK, LD.

This bank with a capital of £2,000,000 in 200,000 shares of £10, announces an issue of 100,000 shares at par. The company has been formed as a joint stock bank, with heead office in London, to "carry on all discriptions of banking business in the large field for commerce now open and rapidly extending in Japan, its dependencies, Korea, and the Far East, adn elsewhere." The success of such a venture of course, depends entirely on this futnre management, and its shares can, at present, only be regarded as an interesting speculation. The board is a very strong one.

GEN. INSTRUCTIONS FOR LOCATING ENGINEERS

(Continued from page 33.)

Sec. 6.—The chief of party will give special attention to the determination of the necessary length of bridges and size of culverts; that is, the water discharge area to be provided, and, as far as practicable, give his judgment as to the kind of structure required. Only an approximation of this, of course, is possible on preliminary lines, as the class of structure usually depends upon the nature and depth of foundation, which can only be determined by borings and which are not to be undertaken on preliminary, except in cases of important structures.

It is desired to particularly impress upon the chief of party and levelman the extreme importance of determining, as the survey progresses, all high water marks and overflow limits. On the lines in hand, the most serious difficulty to be overcome is the proper and sufficient care of the wet season's rainfall.

He will enter in his note book an estimate of the acreage and a general description of each area, the drainage of which is to be carried through each waterway; laso any other matters of importance bearing upon the question of drainage discharge and foundations. He will also make particular and careful investigations regarding stone, sand, water and timber, their availability and fitness for use in constructing the masonry necessary for the bridges and culverts he proposes. These notes are to be full and explicit, and at the close of each distinctive survey are to be placed in the form of a report to accompany the returns on the survey.

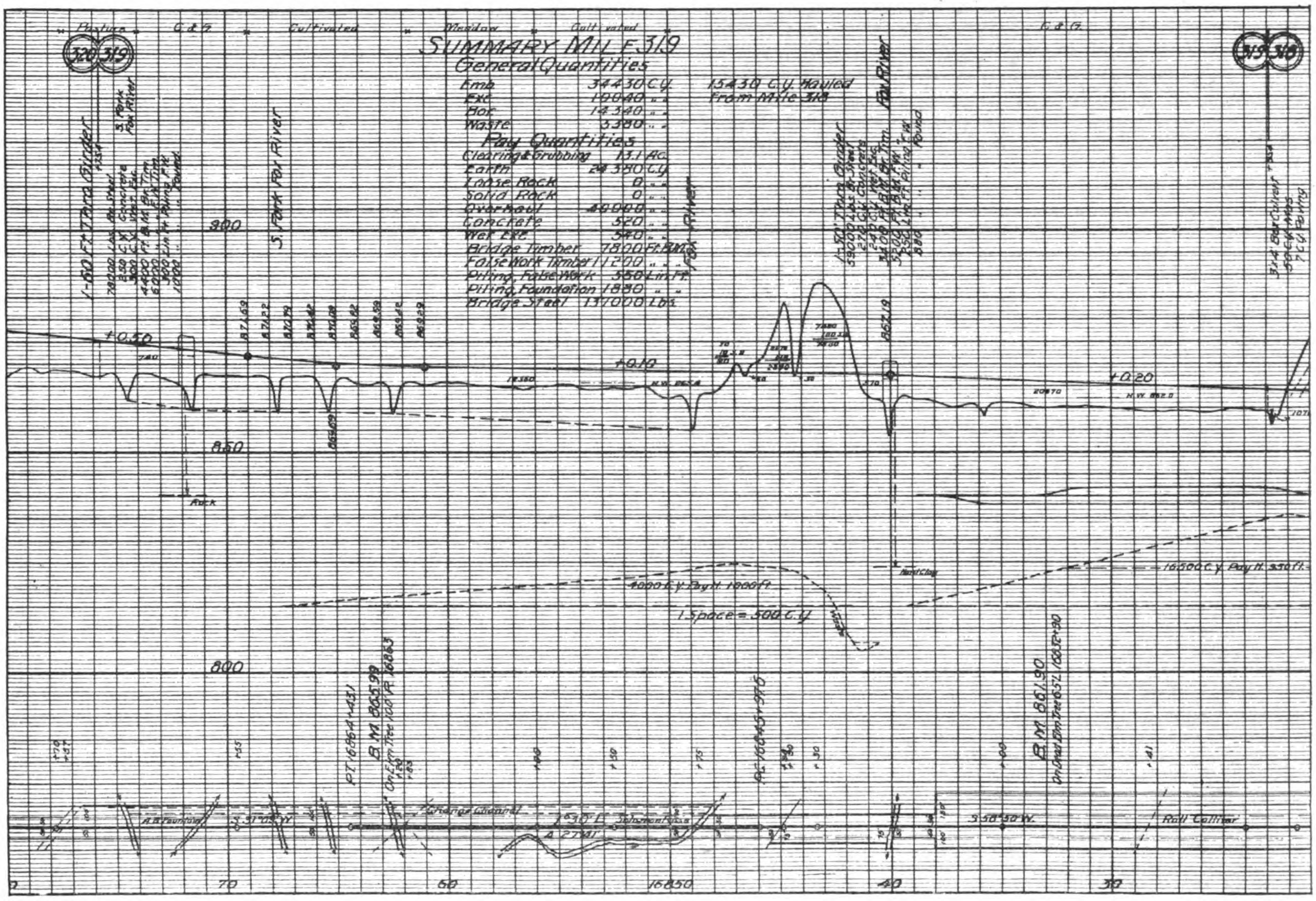
Sec. 7.—The draftsman, aided by the transitman, will plot all preliminary lines on the night of the day they are run, on 36″ duplex manila paper, to a scale of 400′ to the inch. The paper is to be of such length as will contain sufficient preliminary line to embrace 25 miles of continuous location. The following day the draftsman will check, ink in and station the line in *red*, and will plot all topography taken inking in each contour with India ink diluted to a consistency that will give a line of a lead pencil shade, except each 50′ contour which he will draw in with undiluted India ink, giving the elevation on each contour, as per sample of standard map attached. The trend of all streams is to be shown in blue, direction of their flow by an arrow; all other topographical features to be in undiluted black India ink. He will keep the line and topography at least 3″ from the edges of this 36″ map roll, and will not piece out the map on the sides by pasting on pieces of paper, it being preferred that the line be broken in order that all lines and topography be contained within the 30″ field. It is not intended that this relieve the draftsman and others concerned from making every effort to so start their line as to have it contained within this field with as few breaks as possible.

In plotting contours on the 400′ map, the drafstman should draw three faint pencil lines on each side parallel to and 100′ apart, by scale, from each preliminary tangent, and at right angles to them a line through each station producing 100′ squares corresponding to those used by the topographer, and by eye, instead of scale, transfer the topographer's sketches to his map. After inking in, the draftsman will erase the pencil lines.

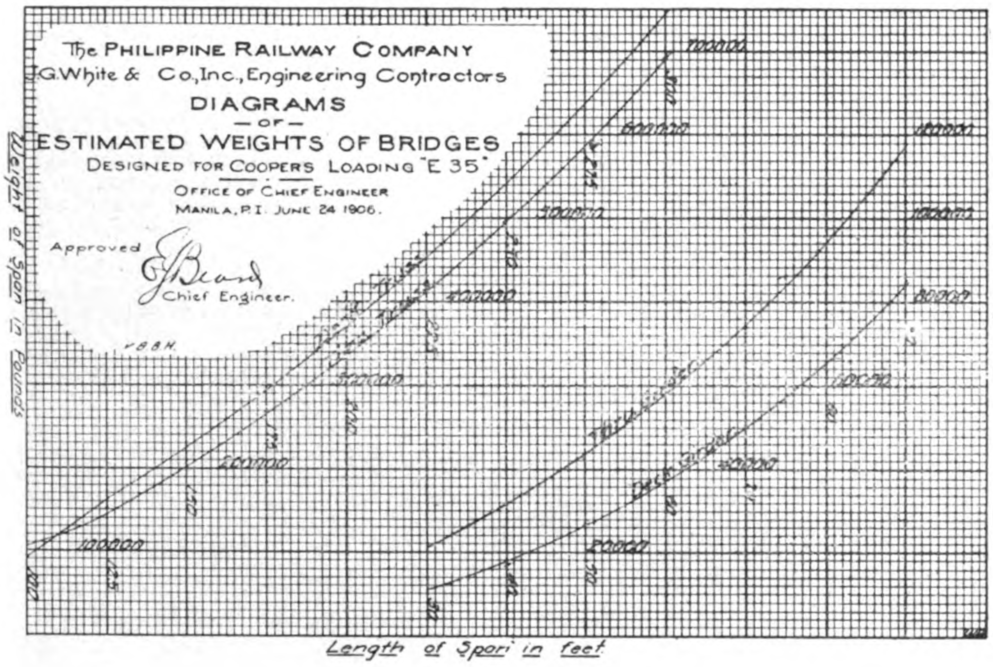
All maps are to be made with the N. point in towards the top of the map and at such an angle as will keep the general direction of the line as near the centre of the roll as possible, breaking the line only when necessary to keep at least 3″ from the edge of the 36″ roll.

Sec. 8.—On the 400′ map the chief of party will project, in pencil, a projected location, scaling its alignment and station and mile throughout. The same regard is to be given to the projection alignment as if the line were being run in on the ground, and the rules later laid down as to alignment, etc. *(Sec. 21)*, are to be fully observed. No projection is to be inked in, but left in pencil, so that the final location can be inked in on this original topographical map and the same turned in as the final 400′ map of the located line.

Sec. 9.—Whenever possible, before beginning a survey, the chief of party will be furnished with a vicinity map of the country his line will traverse, on a scale approximating 1″ to the mile, showing the general characteristics of the country, for the uses hereafter named. If, however, the chief engineer's office lacks the data to either compile or furnish such a map the chief of party will have his draftsman, as soon as the party arrives in the field, prepare such a one on a scale of 5,000′ to the inch from the best data obtainable. This map is to cover the country between the termini of



SPECIMEN OF STANDARD PROFILE



the lines to be run and include a large area on each side. It is to show all the principal streams and other topographical features obtainable at the time, such as towns, villages, highways, mountain ranges, etc., and is to be gotten out as quickly as possible. As soon as it is made send a tracing thereof direct to the chief engineer, retaining the original. On the original, plot the projected location as fast as projected and fill in and correct the topography as developed by the survey, care being taken by the draftsman not to crowd the map with topography, as the object is to only show the general features and not small details, and to show the relative position of the line in regard to the country and its resources at large; however, show the degree of curve and every 5,000′ station and each fifth mile post. With each report of progress on survey, as called for hereafter, send in a small tracing of this or of that part of the line—and added topographical features run in since last report. This showing will be plotted on the full tracing heretefore sent in to the chief engineer's office, by his drafting forces. In any event, send in this small tracing with the report, even if delayed in sending in the full tracing of the whole map.

Sec. 10.—It is expected that all lines and levels run will be plotted the night of the day they are run, whether abandoned or not, and no notes of any line or backup are to be erased, but crossed out by two diagonal lines across the page; the projected location is also to be kept up to date.

Sec. 11.—Every effort should be made to carry forward one continuous preliminary stationing; also when projecting a location, follow side lines when necessary back to the main preliminary line. Unless otherwise instructed the main preliminary line will be stationed from zero. Side lines starting off of this main preliminary line will carry a continuation of its stationing. Each distinctive line is to have a prefixed letter marked on the stakes, profiles and maps, and recorded in the notes respectively, reserving the letters "L" and "S" for location use.

Sec. 12.—Transitmen and levelmen preliminary and final location will keep their notes in accordance with the standard indicated by sample leaves of each attached hereto. The rodman will carry a peg book, and it is a rule when checking turning points that neither levelman nor rodman call for the result until the levelman gives "ready," when the rodman will first call his result—to be noted by the levelman—and the levelman must under no circumstances say he is ready until he has obtained the elevation.

Instrumentmen, topographers and others will place no marks whatever on the outside of the note books they use. They will, upon beginning the use of each, title the fly leaf in the following forms:—

THE PHILIPPINE RAILWAY,

J. G. WHITE & Co., Inc., Engineering Contractors.

Preliminary Levels,
Iloilo to Passi—Panay Island.

Station 0 to 1000.

April, 1906.

J. J. HILL, Levelman. P. H. JONES, Chief of Party "A."

At the same time number each leaf on the right hand page.

Each party will be designated by a letter as Party "A" or "B," etc., and the party's designating letter must appear on all titles, estimates, reports, etc.

WITHOUT FAIL, DATE THE BEGINNING AND ENDING OF EACH DAY'S WORK, making this entry when starting work in the morning and when quitting in the evening; note the condition of the weather under the morning entry and a general note of the day's weather under the evening entry.

EVERY TITLE MUST CONTAIN THE ISLAND'S NAME ON WHICH LINE IS SITUATED TO WHICH THE NOTES PERTAIN, AND NO NOTE BOOK CONTAINING NOTES OF LINES ON ONE ISLAND MUST BE USED FOR NOTES OF LINES ON OTHER ISLANDS.

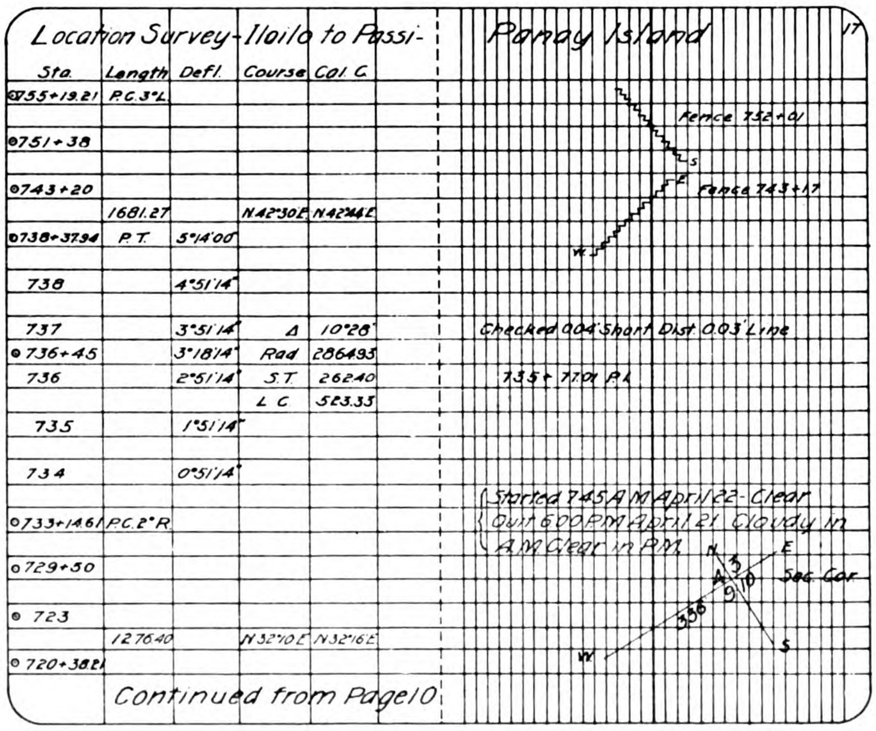
Next to the fly leaf, leave the first page blank for an index of contents. In this index enter station to station of all lines appearing in the book, entering the beginning station and its page at the time the line is started and the ending station and its page when reached or as far as the line is carried continuously in this book; all in such a manner that each station of each line can be immediately found by reference to the index.

In case of a line whose notes are interspersed through the book with notes of other lines, give the page and the book number of continuation of notes, and at the beginning of these notes refer back to the page from which they are carried forward.

Sec. 13.—The levelman will, at the beginning of all lines, refer to and describe the datum upon which his levels are used. The transitman will, by sketch on the right hand page of transit book, particularly describe the starting point of his line. Both these men and the topographer are to carefully enter all equations in case of broken stationing, and at the beginning and ending of each line, the proper equality.

Sec. 14.—Where no datum has been established by the United States Coast Survey, or other government bureaus, a bench will be established and its elevation as carefully determined in relation to mean low tide as time will permit.

Great care must be taken to establish a sufficient number of bench marks of such lasting character as to insure their existence until the completion of construction. On preliminary lines permanent bench marks are to be established every mile, and on final location every half mile will be sufficient,



Location Survey—Iloilo to Passi—Panay Island 17

Sta.	Length	Defl.	Course	Cal. C.
⊙755+19.21	P.C. 3° L.			
⊙751+38				
⊙743+20				
	1681.27		N.42°30′E.	N.42°44′E.
⊙738+37.94	P.T.	5°14′00″		
738		4°51′14″		
737		3°51′14″	Δ	10°28′
⊙736+45		3°18′14″	Rad.	2864.93
736		2°51′14″	S.T.	262.40
			L.C.	523.33
735		1°51′14″		
734		0°51′14″		
⊙733+14.61	P.C. 2° R.			
⊙729+50				
⊙723				
	1276.40		N.32°10′E.	N.32°16′E.
⊙720+38.21				
	Continued from Page 10			

Fence 752+01
Fence 743+17
Checked 0.04′ Short Dist. 0.03′ Line
735+77.01 P.I.
Started 7.45 A.M. April 22—Clear
Quit 6.00 P.M. April 21. Cloudy in A.M. Clear in P.M.
Sec. Cor.

SPECIMEN PAGE LOCATION TRANSIT NOTES

but oftener if enough permanent objects can be readily reached. It must be borne in mind that wooden stakes are subject to displacement by the natives or destruction by white ants and from other causes to rapid decay; therefore, every effort should be made to establish them of stone or metal. The same is true as to line stakes placed by transit parties and frequent ties to permanent objects should be made to insure the ready re-establishment of the line if destroyed by any of the agencies mentioned.

Section 15.—The ground and grade line of all preliminary profiles will be left in pencil, each day's work must be plotted continuously on a roll holding 25 ms. each, side line profile following main line profiles on the same profile roll in the order in which ties are run; this necessarily breaks the main line profile, but brings all profiles in the neighborhood of all other lines covering the same country, which is what is desired.

NO PROFILE GROUND LINES ARE TO BE PLOTTED OVER EACH OTHER.

Each line is to have marked on it by the levelman, at time of plotting, its designating letter, to be large and neat, and placed at frequent intervals. The levelman must be particular to note all high-water marks obtained; mark on every 50′ horizontal its elevation; also enter on the profile all data taken during the day.

Section 16—ALL PROFILES ARE TO BE PLOTTED IN THE SAME DIRECTION AS THE LINE IS PLOTTED ON THE MAP.

Section 17—The draftsman will title the profile, on the outside edge of each 25-m. roll *at both ends*, showing each line and the station to station thereof contained in each roll, in form outlined in *Sec. 12*. The same applies to all manila maps. Observe the important instructions contained in *Sec. 12* about all titles containing the name of island. The main title on face of map or profile will be placed on in the chief engineer's office. At least 18″ of blank paper is to be left at each end of profile and map rolls to allow for a title and wrapper.

Sec. 18.—As fast as the projected location is worked up, the chief of party will, from the contours, have taken off and plotted with care, a profile on which he will lay a grade and show all openings and the alignment. He will show thereon each mile post 5,280′ apart, and unless otherwise instructed, show mileage from zero.

Sec. 19.—From the projected profile make a careful estimate of all quantities up to the base of tie. Include all ditches, sub-grading and back-filling, but do not plot the overhaul nor distribution of graduation quantities. Include station grounds, yards, etc. Estimate the overhaul approximately from inspection. The quantities in embankment should be considered and entered separately between bridge ends and the mouth of cuts. Obtain all structural quantities from blue prints of standard structures, to be obtained from the chief engineer. These standards must be followed throughout and no special structures estimated on without instructions. In estimating graduation quantities, transverse slopes taken from topographical notes, must be taken into consideration, to the end that quantities are sufficient to cover the work to be performed. Classification must be carefully considered and great care taken that it is amply provided for. The data therefor is to be secured in the manner outlined in *Sec. 24*, and all classification quantities as estimated marked on each excavation. Show a summary of each mile as indicated on the standard profile attached. Transfer this summary on to a standard construction estimate sheet, *Form No. 21*, using one line for each mile. Make a duplicate copy of each estimate sheet for each 25 m. and forward to the chief engineer's office, together with a summary thereof on *Form No. 22*.

Location Survey-IloIlo to Passi-Panay Island 8

Sta	B S	F.S.	H.I	Rod	Elev.	
					749.20	Started March 22-7 A.M. Clear. B.M. 60 ft L. of 439+40"N" on White Oak N. Bk 14 page 89
	10.24		759.44			
"R" 0				6.2	53.2	
1				8.3	51.1	
+35				10.4	49.0	
+40				10.8	48.6	
2				8.4	51.0	
3				4.1	55.3	
T. P.		1.06			755.38	On large boulder 3′R. of 3+45
	7.48		765.86			
4				5.4	60.5	
+65				1.1	64.8	
5				3.2	62.7	
6				5.1	60.8	
+30				7.8	58.1	
+60				10.1	55.8	
7				9.3	56.6	
8				8.1	57.8	
9				6.2	59.7	
T. P.		6.23			759.63	Peg at Sta. 9
	9.54		769.17			
10				6.4	62.8	
+60				7.2	62.0	769.17
	27.26 7.29 19.97	7.29				749.20 19.97

SPECIMEN PAGE LEVEL NOTES

Sec. 20.—Prepare and forward with each 25-m. estimate sent to the chief engineer, a statement giving the following information:—

Total length of line, miles,	......
Total degree of curvature,	......
Total length of tangent, feet...., miles,	......
Total length of curvature, ,,...., ,,	......
Percent curvature,	......
Percent tangent,	......
Maximum curve,	......
Maximum grade,	......
Total rise and fall, north-bound, feet,	......
do south- ,, ,,	......
do of each rate of grade used north-bound,	......
do of each rate of grade used south-bound,	......
Total lineal length of bridging, feet,	......
This bridging to include only open deck.	

Sec. 21.—A statement is attached giving the weights of the company's standard steel bridges. These weights will be used in making up the estimate. Similarly, statements are attached giving quantities in standard culverts, abutments, piers and other masonry structures.

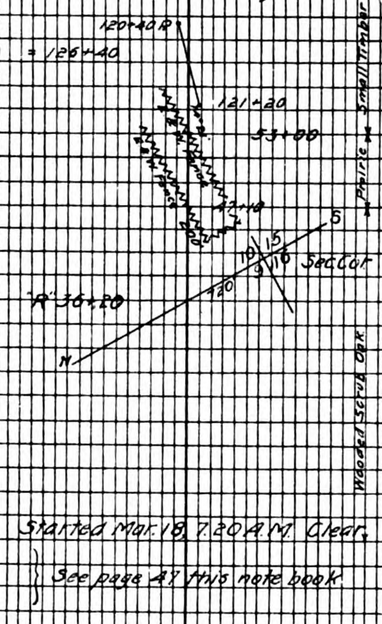
Sec. 22.—On final location, the chief of party will be expected to better the projection in detail, as far as possible, but no great deviation from the approved projection is to be made without authority covering each case; at the same time, each chief of party will be held responsible for not suggesting improvements that could be made in connection with which he has not protected himself by calling his superior's attention thereto in writing.

Upon location it will frequently be found advisable to run further preliminary lines in an effort to obtain better results. These will be termed "spur" lines and are designated by the letter "S" and consecutively as S-1, S-2, etc. They will be plotted on a preliminary profile separate from the location profiles, which latter is to be continuous, indexed, etc., exactly as defined for preliminary lines.

On location, ink in the located line on the 400′ contour map and obtain such data as is

Line "R" Preliminary Survey — Iloilo to Passi-Panay Island 10

Sta	Length	Defl	Course	Calculated Course
61+40				
58				
	1020		S.53°00′E.	S.53°56′E.
51+20		2°00′L.		
	402		S.52°00′E.	S.51°56′E.
47+18		5°30′R.		
	368		S.57°00′E.	S.57°26′E.
43+50		4°00′R.		
36+20				
29				
	1950		S.61°00′E.	S.61°26′E.
24		3°00′L.		
	400		S.58°00′E.	S.58°26′E.
20		7°00′L.		
	2000		S.51°30′E.	S.51°26′E.
12+31				
=0-"R"		21°15′R.		
446+90"N"				
	970		S.72°30′E.	S.72°41′E.
437+20"N"	Backsight			



SPECIMEN PAGE PRELIMINARY TRANSIT NOTES

necessary to complete this map in every particular as to property ties, boundary, etc. Show the alignment; *p. c.'s; p. t.'s;* degree and angles of curves; stationing and mile-posts; the stationing and plus at each property tie, and all angles thereto obtainable. Show the right-of-way required to construct the road allowing sufficient for borrow pits and waste banks; all property owners whose lands are crossed and the acreage required from each. The terminal of the line is to be fixed by course and distance to the nearest existing corner of the public survey where obtainable. On each map place the N. point showing the true and magnetic bearing, noting the variation obtained in the field and placing the true course only on long tangents so as not to crowd the work. From this map make a tracing in 25-m. sections, omitting the contours, showing all else on this tracing.

Sec. 23.—A blue print of the standard sizes and titles of drawings is attached, and is to be followed by the draftsman in the field, excepting where otherwise specified in these instructions, and in all cases is to contain the date of completion of map, name of the chief of party and of the draftsman executing the drawing. Draftsmen will always make their tracings on the dull side of the cloth and bear in mind that their tracings must be one of two standard widths, either 36" or 18".

Sec. 24.—On location, chainmen will be supplied with plumb bobs, which are to be used on all location chaining to the end that all measurements will be correct, a final measurement to be taken after the station stake is driven. This is not necessary on preliminary lines.

Sec. 25.—On location, determine approximately all drainage areas discharging to minor openings and plot their boundaries upon the 400' map. At bridges and large openings, and when practicable in case of minor openings, cross-section areas are to be obtained by determining the high water mark where the line crosses, also at a point considerably above the opening, and at another considerably below the opening, and at those three places take the cross-section discharge area of the stream; also obtain, as far as possible, the fall of the stream, selecting for the measurement, whenever possible, places where the stream at high water would be entirely in flow. Plot all discharge area sections on cross-section paper in accordance with the ravine section attached, giving all the data called for therein and by the foregoing.

On location, chiefs of party, unless otherwise instructed will organize a sounding party properly equipped with drill and sounding apparatus in charge of a man accustomed to construction work and classification. This party will sound all cuts, from which sounding the chiefs of party will determine the classification in excavation; location of all holes and notes thereof are to be plotted on the profile. In case the apparatus furnished is insufficient to give satisfactory results, test pits will be sunk sufficient in number as, in the opinion of the chief of party, are necessary to enable him to determine closely the character of excavation that will be encountered. He will sound all bridge openings to determine, for construction purposes, the depth and character of foundations. He will plot the results of all soundings on the ravine sections and profiles. It is expected that at all openings requiring deep masonry foundations, arrangements will be made for a pipe and bit drilling outfit in charge of a separate party, such work usually requiring a more extensive equipment than that carried by the regular sounding party. The chief of party will personally give close attention to the work of the sounding party under his direction, to the end that a reasonably accurate determination will be arrived at as to the amount of classification and the nature of soundings.

Sec. 26.—On location, additional and fuller notes and ties beyond those on preliminary must be obtained in towns or cities, full notes of street connections, etc., copies of plats thereof when obtainable must be taken so as to enable the draftsman to put the correct layout of each town, village or city on the map.

Sec. 27.—In projecting alignment and in running in the location no curve must be permitted over a bridge, but may be over culverts, nor must any *p. c.* or *p. t.* come within 300' of any bridge. This positive instruction must not be avoided without the approval of the chief engineer, then the curve must be so located as to bring the bridge as near its middle as possible. At least 1,000' of tangent must be provided between reverse curves, and two curves in the same direction within 2,000' of each other are to be considered bad practice. It is preferred that curves be always of an even degree index, and with a little care it is seldom necessary to have them otherwise. Easement curves will be used on all curves of 2° and over, but unless it develops that the maximum curvature will exceed 4°, no notice will be taken of these easement curves by the chief of party, as the offsets can be readily cared for by the construction engineer. The maximum curvature desired by this company is ....degrees *(see Sec. 3)*, the minimum 30 min. and no curve must be less than 600' in length. It is recognized that at times severe topography will require an increase over this maximum, but such curves should be used with hesitancy and only for good cause.

The position of curves in relation to the grade line has a marked effect on the economy of operation, by their limiting effect on speed at points where the gradients will economically allow high speed. The sharper curves are least objectionable near high summits, next on long level or minor gradients, and the most objectionable on the lower reaches of steep gradients. The expense arising from their position is an additional and separate one from that arising from the wear and tear due to curves. The maximum gradients will, in all cases, be compensated over curves at the rate of—

00.3 per degree	for all curves over 8 deg.	
00.4	do	3 ,, and less than 8,
00.5	do	less than 3 deg.

Sec. 28.—In projecting and locating the line, the resulting grade planes must be carefully considered. The maximum grade can only be determined upon after the completion of the preliminaries, and when decided upon, is only to be used where necessary and in as short planes as possible. In laying minor gradients it is not desired that long continuous planes be secured at an additional expense for construction. Broken grade lines with sags whose vertical depth is equivalent to, or less than, the velocity head resulting from ordinary freight train speed, is not objectionable; but all gradients and sags must be connected with vertical curves having a rate of change of not less than 0.05 per station. Vertical curves over summits will be uniformly 400' in length, regardless of what the rate of change may be.

Chiefs of party, for the purpose of estimates, will lay a grade line on their projected location and also on final location profiles, but each is to be left in pencil and not inked in until approved by the chief engineer. This approval will generally occur after the transmisison of the final profiles to this office. In laying the grade line, the chief of party will try more than one, in order to ascertain the most economical by calculating the pay quantities to one or more grade lines, taking into consideration all matters in connection therewith, such as classification and the changes in character and dimensions of drainage structures, due to a higher or lower grade line, and adopt one that will give the least total cost. This involves a very thorough knowledge of the classification that will be encountered, as in hard cuts the grades may often be raised, thereby increasing the fill beyond what appearances might seem to warrant.

Much care and study should be given from the first projection to the completion of the location, looking to as economical an adjustment of the grades and lines at stations as possible. They should be located on tangents that extend at least 2,000' each way from the headblocks of the passing track, which it is expected on this work will not exceed 1,500' in length. When the location of a station on a curve cannot be avoided, locate the buildings and sidings on the outside of it, so as to give the train engineers as good a view as possible. Through station grounds, grades should be laid as close to the ground as permissible, and provision made for obtaining the material without creating objectionable borrow pits on the station grounds. This can often be accomplished by adopting a semi-circular cross-section the entire width of the station grounds, much as a highway is graded up. The grade through station grounds and for a train length beyond each passing track headblock should be, at least, 0.4 less than the ruling grade, and it is preferable that station grades summit near the depot. In addition to this, it will result in economical operation to keep the grade as much below the maximum as possible for as long a distance as possible each way from all stations, in order that trains may get under way as rapidly as possible.

Sec. 29.—It is this company's rule that the rates of grade shall be in even tenths, except on long supported grades where compensation for curvature necessitates taking advantage of every foot and carrying the rates and grade elevations to hundreths.

Sec. 30.—Every Sunday draw up and mail to the chief engineer a brief letter report giving progress made during the last week, accompanying this weekly report with a pencil tracing profile, whenever possible, of the projection or location, as the case may be, together, in all cases, with a tracing of the 5,000' map showing the line run since last report, as given in *Sec. 9*.

Sec. 31.—Address all mail to the Chief Engineer of the Philippine Railway Company, Manila, P. I.

TAKING PHOTOGRAPHS

Sec. 32.—Each party will be furnished with a No. 3-A Eastman kodak, tripod and carrying case. Six rolls of films, of ten exposures, will accompany same. Additional films will be furnished from time to time, as requested.

A book of instructions accompanies each kodak, and the instructions relative to the loading, focusing, making exposures, time of exposures, use of stops, etc., should be carefully followed.

Time exposures are more desirable than snap-shots, allowing a smaller stop or diaphram opening to be used, thereby increasing the sharpness of the picture.

Pictures taken should show the principal topographical features, points of interest, rivers crossed, scenes in villages and towns along the line of survey, and views of locating parties at work in the field, moving and in camp.

Pictures are to be taken for two purposes:—*(1st).* To convey information as to country traversed by line. *(2d)* To supply the Press, especially the Technical Press, with views showing the work being done by J. G. White & Co.

TAKE AS MANY VIEWS OF ANY ONE SCENE AS ARE NECESSARY TO PROPERLY ILLUSTRATE SAME.

Make a record of each exposure, giving party letter, number of exposure, name of island, date, title, weather, length of exposure, stop used, location of view point and object photographed with reference to stations on line of survey and time of day. Form No. 23 is furnished for this purpose, which must be filled out AT THE TIME OF MAKING THE EXPOSURE IN ALL CASES. Whenever necessary to properly describe point of view and object photographed, make sketch on back of record blank. Each exposure should be numbered consecutively, prefixing the party letter. When the entire roll has been exposed remove from kodak, seal, and note, on the gum paper used to seal it, the number

of exposures contained in the roll, for example: the first roll exposed by Party "A" will be marked Exposures A-1 to A-10 inclusive. Inclose record slips, retaining carbon copy, with roll of films, and mail to the chief engineer's office to be developed. Note on the outside of the package that same contains films. If, upon developing, it is found that negatives have been under or over exposed, or wrong stops used, the chief engineer's office will so advise.

ACCOUNTING—TIME AND PAY ROLLS.

Sec. 33.—(1-A) Each chief of party will be furnished with a time book, *Form No. 10*, in which he will keep and distribute the time of each employee in accordance with *Sec. No*.......; this book to be retained as the chief of party's record of all labor performed under his direction. *(1-B)* At the end of each month the chief of party will make up from his time book a time roll, *Form No. 11*, giving the name of each employee, rate, total amount, deduction and net amount due. If an employee works by the day, his rate is to be given by the day; if by the month, the days worked will be the numerator and the days in the month will be the denominator of a fraction which, when multiplied by the monthly rate, gives the amount earned by the employee. No change in any salary or rate of wages is to be made without the approval of the chief engineer. *(1-C)* Each white member of the party and such Filipino employees as assent thereto, will be paid monthly and carried on monthly time roll, *Form No. 11*. It is expected, however, that it will be necessary to pay most of the native labor oftener, and for them a weekly memo pay roll will be prepared on *Form No. 11*, Time Roll, in the office of the chief of party. Payments to them will be made whenever, in the judgment of the chief of party, it is necessary by cashing a SERVICE VOUCHER, *Form No. 14*, a supply of which must be kept on hand, and no labor payment is to be made without at the time issuing such a voucher. In the same way pay men discharged or leaving the service. Service vouchers issued and paid by chief of party will be attached to his monthly expense account and entered thereon as cash expended. In all cases, show service voucher numbers, and the name of every party receiving a service voucher must appear on the time roll. The chief of party, when returning time rolls, covering monthly men, will accompany the same with a summary time roll covering the weekly time rolls, *Form No. 11*, which summary is to have attached all the time rolls covering daily men. No monthly employee's name must appear on more than one time roll during working period. *(1-D)* In case it is desired to transfer an employee from one party to another, or from one division to another, the chief of party making the transfer will issue a transfer letter to the chief of party or other superior officer to whom the employee is to report, stating reason of transfer, time and amount due employee, and distribution. The chief of party to whom employee reports will carry his time for the entire working period during the month, also such additional time allowed for actual traveling time required to reach his objective point, showing in his monthly distribution proper amount chargeable to division or party from which employee is transferred.

Sec. 34.—Distribute the amount of time roll to the proper sub accounts of "Engineering, Account No. 1," in space provided on face of time roll, *Form No. 11*, as directed in *Sec. 39*.

EXPENSE ACCOUNTS.

Sec. 35.-A—Sufficient funds will be advanced to chiefs of party to cover estimated authorized necessary monthly expenditures, and also labor paid on service vouchers. *(35-B.)*. Receipts for all expenditures other than labor will be taken in triplicate on *Form No. 20*. *(35 C.)*. At the end of each month the chief of party will make up, using writing fluid, an expense account in triplicate on *Form No. 13*, including thereon every expenditure for which he seeks reimbursement and attach thereto all receipts and service vouchers prescribed by *Sec. 33-1-C*, and *Sec. 35-B*. After each entry give receipt or service voucher number, placing as many items on each line as convenient, and observe the instructions on back of *Form No. 13*. *(35-D.)*. Receipt the expense account, *Form No. 13*, as paid, in which condition it stands as an offset by its amount against the funds advanced under *A* of *Sec. 35* and until, in order to keep you in funds, a pay voucher for the amount thereof approved by the chief engineer is sent you. In this way chiefs of party will be kept in funds to meet their current expenses.

Sec. 36.—When making your monthly expense account, prepare a monthly cash balance sheet, *Form No. 15*, giving balance at 1st of each month, cash by voucher or otherwise received of the company during current month, and balance on hand at date. If any differences are found by the account departments, immediate notice will be given you in writing, otherwise, if found correct, no notice will be given.

Sec. 37.—Each chief of party will keep on hand the necessary forms and blanks, to enable him to comply with these instructions, to be procured by requisition on *Form No. 16*, addressed to the chief engineer at Manila. This, and all requisitions for stationery, subsistence supplies, etc., must be made in the first day of each current month, and in amount sufficient to meet all requirements of the following month, it being understood that ONLY ONE requisition each of *Forms 16* and *17* should be made each month.

Sec. 38.—Expense accounts and pay rolls will be distributed on *Form No. 18*, Cost of Surveys, and pay rolls and expense accounts on *Form No. 19*, in accordance with the sub accounts of Engineering Account No. 1.—*Sec. 39*.

Sec. 39.—Sub-Accounts: Railroad Transportation, *(1-A)*. This account to include all fares to and from field, living and incidental expenses while in transit that are necessary to put the party to or from the field. Hotel and Commissary, *(1-B)*. This account to include board and lodging of party or all subsistence supplies purchased and furnished to party while in the field, the transport cost and wages of cooks and attendance connected with providing and preparing subsistence. Tools and instruments, *(1-C)*. This account to include the cost and repairs of all tools and engineering instruments used in conducting surveys. Camp Outfit, *(1-D)*. This account to include all tents, houses, cots, cooking utensils and items of like nature necessary to provide quarters and plant for cooking. Livery and Transportation on Work, *(1-E)*. This account to include all expenditures for transportation of party or individual members while engaged in conducting surveys and after reaching the field, such as cost and subsistence of pack animals and their attendants, boat fares and boat hire and all expenses connected therewith not included in *1-B* of *Sec. 39*. Survey Wages, *(1-F)*. This account to include the salary or wages paid to engineers and their assistants actually engaged in conducting surveys in the field or handling office work connected with such surveys not included in accounts heretofore specified.

Sec. 40.—From the foregoing, *Sec. 33* to *Sec. 39* inclusive, the chief of party will fill out on the 1st of each month and on that day forward to the chief engineer the following:—

Form No.		
11	—	Time roll
13	—	Expense account
15	—	Cash balance statement
16	—	Stationery requisition
17	—	Material "
18	—	Coast of survey
19	—	Distribution
21	—	Estimate

Forward all inclosures under one cover by prescribed route and means of transportation as may be designated.

JAPANESE PIECEGOODS IN MANCHURIA

SCHEME TO DEVELOP THE TRADE

The *Tokyo Asahi* states that five cotton textile companies in the Kansai district, viz, Osaka Boseki, Miye Boseki, Kanakin Sheishoku, Temma Orimono, and Okayama Boseki, have formed a guild for the exportation of cotton goods to Manchuria. The guild is to entrust Mitsui & Co. with the sole business of selling their goods. The above mentioned factories will manufacture cotton goods equal to the standard quality, and label them with the same trade mark. They will export at least 12,000 bales (valued at 1,200,000 *yen*) every year, and keep up the exports, even though they incur some loss in the business. The Mitsui Co. has decided to do its best to push on the sale, and the service will be rendered free of charge for the time being. In order to successfully promote their enterprise in the face of inevitable competition, the parties concerned have approached the Ministers of Finance and of Communications with the following requests:—

(1.) The Government to guarantee a maximum loan of 6,000,000 *yen* at the rate of interest of 4 per cent. per annum, to be advanced on documentary drafts, payable in 4 months. The loan to be advanced in gold in Japan and repaid in silver at the place of payment of the drafts, according to exchange quotations on the date of payment of the drafts.

(2.) Goods mentioned in the drafts to be delivered under certain limitations, even before they are paid or when a security has been furnished, according to circumstances.

(3.) The Chinese Eastern Railway to carry the exports free of charge or at half rates for one year hence.

(4.) The marine freightage also to be reduced to one-half for one year hence.

In this connection, the Government has decided to make the loan through the Yokohama Specie Bank, without limitations as to the amount, not only on cotton textiles but on matches, cement, beer, marine products, timber, cotton yarns, and other goods to be exported to Manchuria, at the rate of 4½ per cent. per annum. In case a single concern or company has effected an export of more than 5,000,000 *yen* a year, the Government will refund ½ per cent. of the interest mentioned above. As regards freightage, the Government will carry out negotiations with the War Office in connection with the Chinese Eastern Railway, and also with the N. Y. K. and Osaka Shosen Kaisha.

The Government will pursue a similar policy with regard to Korea, where the Dai-ichi Ginko (First Bank) is to act as the Specie Bank acts in Manchuria.

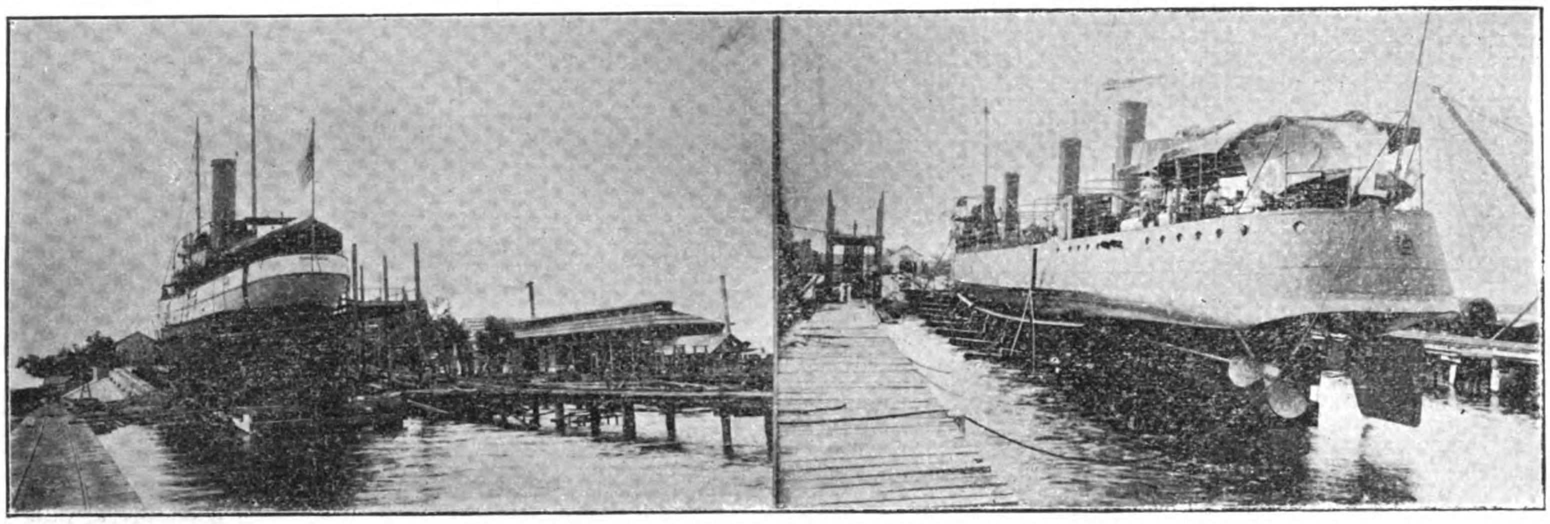
THE CHENGTING-KAIFONG RAILWAY:—The branch line of the Chinghan railway connecting Chengting with Kaifong has been so far completed that construction trains were given to run through the entire line on the 4th inst.

It is reported that the line will be formally opened to public traffic on June 21st.

KOWLOON-CANTON RAILWAY:—It is reported in Canton that the agreement re the Kowloon-Canton Railway has been satisfactorily arranged between the Viceroy of Canton and His Excellency Sir Mathew Nathan. The trouble was in connection with the Chinese section of the line.

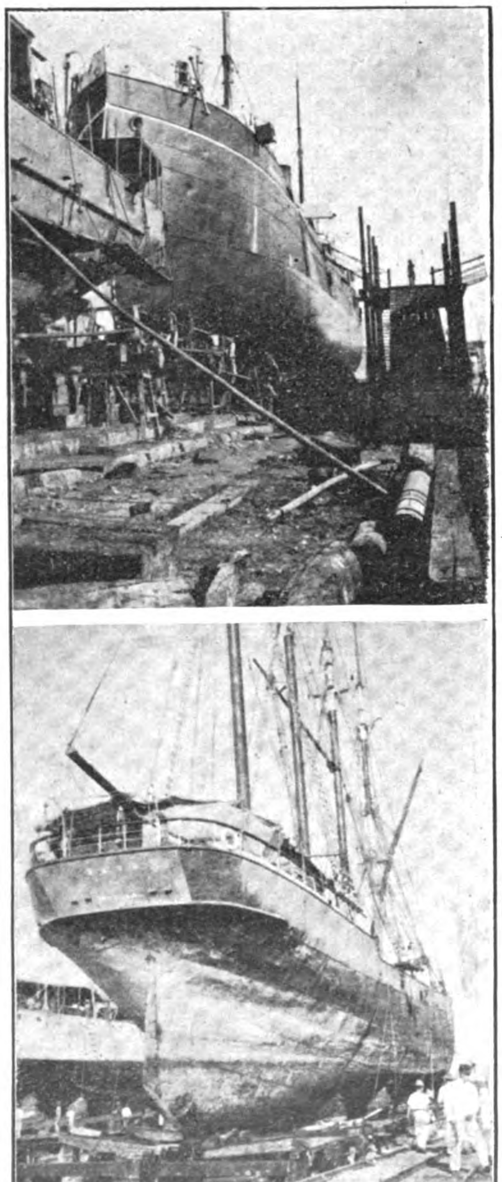
CHINESE EASTERN RAILWAY:—According to a Peking despatch, the freight rates on the Russian section of the Chinese Eastern Railway have twice been increased. The reason alleged is that Russia desires to divert to Vladivostock the goods traffic of North China ports.

It is said that the F. M. S. Railway will be extended to Kuala Muda, P. W., and that Butterworth will be made the principal passenger station, whilst Prai will be converted into a goods and coaling station.



U. S. S. "PISCATAQUA" AND TORPEDO BOAT "DALE" ON SLIPS

THE "VARADERO" SLIPWAYS AT CANACAO



FOUR MASTED SCHOONER "ALTA" AND S. S. "MINAS DE BATAAN" UNDERGOING REPAIRS AT CANAÇAO

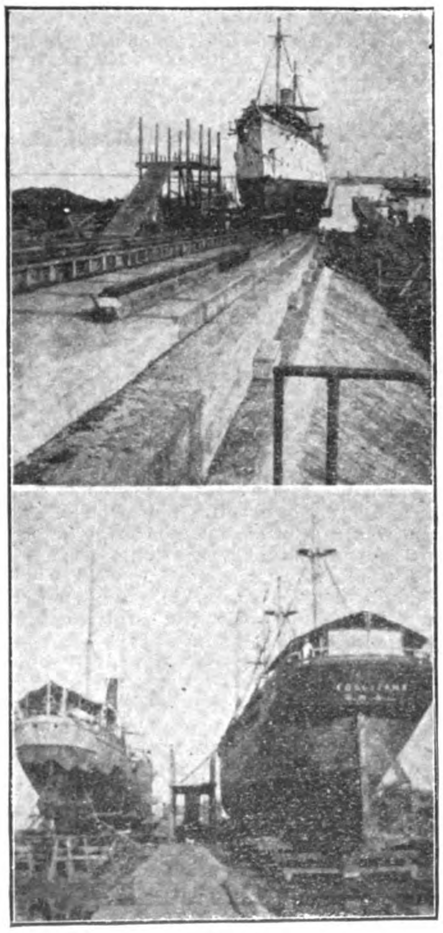
The oldest established shipyard in the Philippines, located at Cavite, is known as the "Varadero de Manila" or the Manila Slip Co. Here in the sheltered bay of Cañacao vessels can anchor and repair work carried on in any weather. The works have been built up by native capital and brains under the management of Mr. Rafael Reyes, a type of the high class Filipino capitalists who have faith in the development of their islands.

From a small beginning the enterprise has increased, despite many drawbacks and unjust competition, to its present capacity. Two marine railways have been built, one capable of docking a vessel of 2000 tons, gross register, and the other up to 1000 tons. An extensive plant, with machinery and tools for handling this class of work, has been developed, consisting of plating and boiler shops, where any type of boiler can be made and repaired, smithy, foundry, fitting, carpenter and coppersmith shops and a large machine tool equipment with all the requisite appliances for carrying on the necessary repairs to hulls, boilers and engines. A large capital is constantly tied up in keeping up the necessary stock of materials for the proper prosecution of repairs and building.

For a long time these docks were the only available ones for the smaller vessels of the navy and the coast guard service, and if the proper encouragement had been extended to them, there would have been no necessity for the erection of the government slipway at Engineer's Island, which diverts a large share of patronage from the struggling engineer firms of Manila.

The "Varadero" has proven its ability to handle its share of the government work, within its limitations, and the following war vessels have been successfully docked and repaired since the American occupation of the Islands: The United States ships "Wilmington," "Helena," "Petrel," "Castine," "Marietta," "Princeton," "Vicksburg," "Annapolis," and the captured gunboats "Isla de Cuba," "Isla de Luzon," "Don Juan de Austria," "Villalobos," "Elcano," "Quiros," "Pampanga," "Paragua," "Samar," "Callao" and "Arayat," also the large seagoing tugboats "Piscataqua" and "Wampatuck." The transports "Pompey," "General Alava" and "Manila" have also been docked and repaired.

In the earlier days, under the patronage of the Spanish Government, and before being placed in competition with the cheap labor of the China coast, considerable shipbuilding was successfully undertaken by this local concern. The gunboats "Pampanga," "Paragua," "Samar," "Callao" and "Arayat" were built for the Spanish Government during the years 1887 and 1888 at Cañacao, and the excellence of the work is attested to by the fact that the boats are still in service. If such work can be turned out locally, it is a strong argument for further patronage, instead of sending capital to China an Japan.

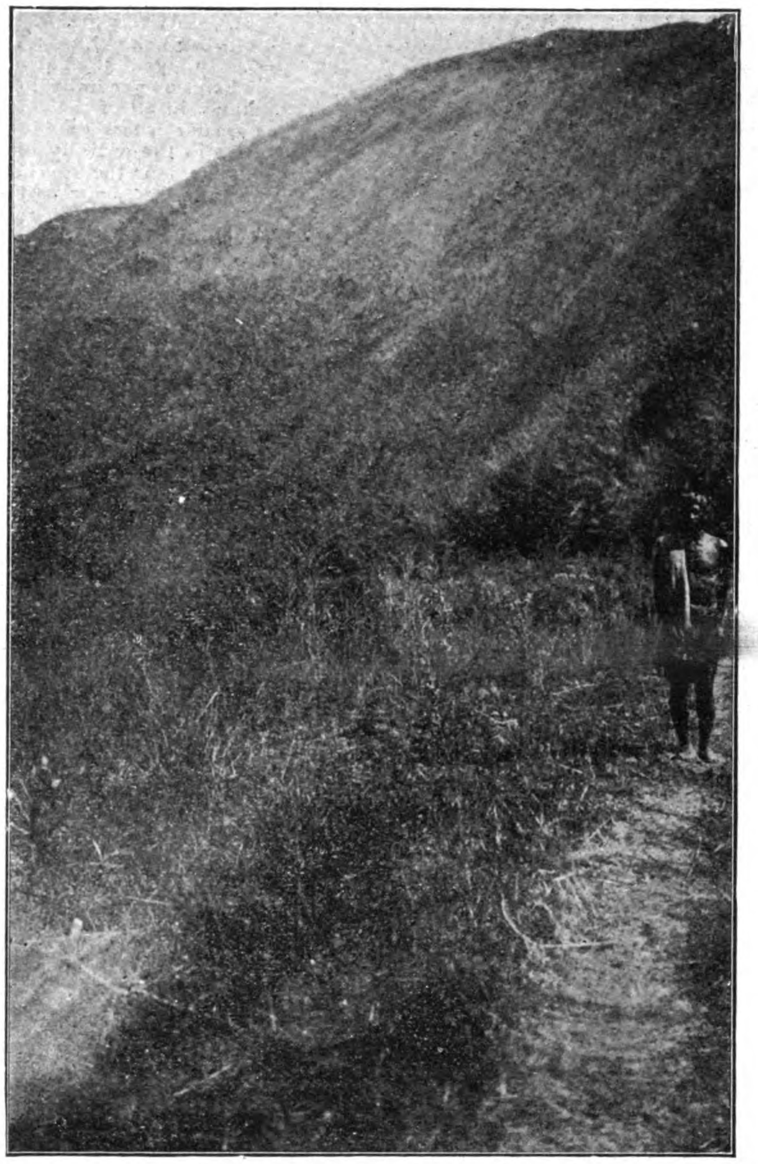


U. S. GEODETIC SURVEY STEAMER "FATHOMER" AND COAL HULK ON SLIPWAYS

Besides the above mentioned gunboats, numerous small merchant vessels for the inter-island coasting trade, and lighters and cargo boats have been successfully built and engined from these shops. One of the gunboats, the "Bulusan," constructed for the Spanish Government was destroyed and sunk by the insurgents. The Company also built 12 steel and iron coal barges for the United States navy, shortly after the occupation, to the complete satisfaction of this exacting branch of our service.

PRELIMINARY RECONNOISSANCE OF THE MANCAYAN=SUYOC MINERAL REGION, LEPANTO, LUZON, P. I.—III

(By ARTHUR J. EVELAND, M. E., Government Geologist)



ON THE OLD SPANISH ROAD, MANCAYAN

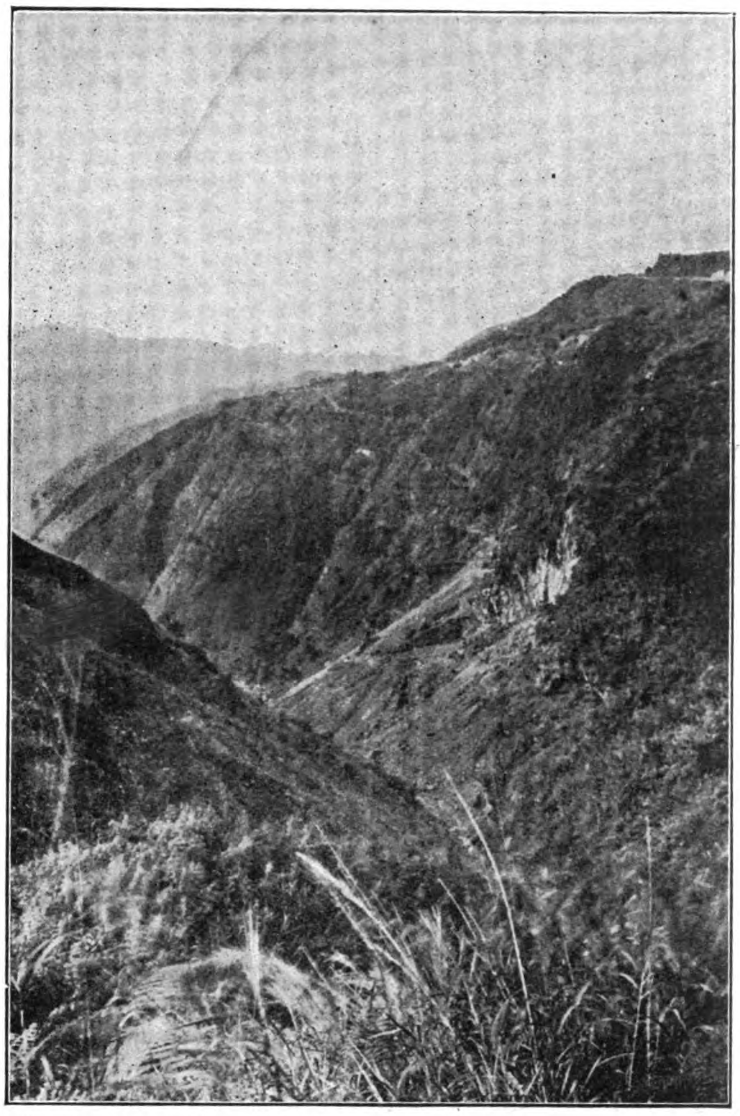


Photo by A. J. Eveland.

COPPER MINES, MANCAYAN

CHAPTER VI

ORE DEPOSITS. MINERALOGY OF THE ORES, GANGUE MINERALS.—Under the head of gangue minerals are included those most intimately connected with the metallic minerals of the lodes, and which form the matrix of the latter. The term is used in its commonest sense, to signify the constituents of the lode that occur in intimate connection with the mineral under exploitation, and as the ores of this district are of a prevailing type, no ambiguity will result.

Quartz.—Comp. SiO_2, oxide of silicon=oxygen 53.5, silicon 46.7=100. Massive or in hexagonal prisms terminated by rhombohedrons. Often in double six-sided pyramids. Generally white or colorless. Hardness=7. Sp. gr., 26. Luster, vitreous, sometimes greasy. Transparent to opaque.

The quartz of this region shows essentially the same characteristics of vein quartz that occurs in most mining districts. There is present a comb-structure quartz showing "crustification," or banded-vein structure, having its origin in the filling of fissures either by growth in an open space or by slow expansion of a mere crack. The quartz of the Mancayan mines is hard, tough, compact, of a resinous luster, much shattered, and of a fine grain. The quartz from this locality is, from its observed nature, due almost entirely to secondary action of silicifying solutions. Replacement of other minerals and the filling of rock fractures have produced a quartzose mass, the bulk analysis of which shows a high per cent of silica. Such rock in thin sections under the microscope may reveal skeleton-like forms of crystals of other minerals, replaced entirely or partially by silica.

Almost without exception the vein-filling material of the region is quartz, the proportions of other minerals present being variable. There are, besides, occurrences of minerals other than quartz in that capacity which may be spoken of.

Barite.—Barytes. Comp. $BaSO_4$, barium sulphate, orthorhombric, commonly in tabular crystals, in divergent form, or massive. From its high specific gravity (4.5) it takes the name "heavy spar." Cleavage perfect in three directions. White. Transparent to opaque. Sometimes yellow, gray, brown, or red. Barite is less important as a vein material in this region, but its occurrence is noted.

Calcite.—Calc spar. Comp.—$CaCO_3$, calcium carbonate=carbon dioxide 44, lime 56=100. Rhombohedral. Cleaves perfectly in three directions producing rombohedrons. Commonly in this form, or prisms, scalenohedrons, or massive. Color variable, where impure, generally white or colorless. Transparent to opaque.

Unimportant as a vein material, though occurring throughout the district. Found in abundance as a microscopic constituent of lode materials.

Kaolinite.—Kaolin. Comp. $H_4Al_2Si_2O_9$ or $2H_2O.\ Al_2O_3.\ 2\ SiO_2$=silica 46.5, alumina 39.5, water 14=100. Monoclinic. In scales or plates, and generally in fine white powder. Occurs as clay-like masses, compact, mealy, or friable. H.=2-2.5. Sp. gr., 2.6.

This mineral occurs throughout the district, and especially in the Suyoc region, as a result of the decomposition of rock material, aluminous minerals, and feldspars. At Mancayan veins of several inches in thickness run through the upper trachyte; these are very pure kaolin, of a good white color. They crop out south of the village on the main trail.

Gypsum.—Comp. $CaSO_4$, 2 H_2O, hydrous calcium sulphate=sulphur trioxide 46.6, lime 32.5, water 20.9=100. Monoclinic, varieties selenite in transparent tabular crystals, to massive, often fibrous, cleavage on one plane eminent, giving foliated structure. H.=1.5-2. Sp. gr., 2.3. Luster, subvitreous to shiny. Color usually white; varieties, where impure, colored. Transparent to opaque. The occurrence of gypsum at Suyoc is suggestive of recent volcanic activity. In the gorges of the Pacat Rivers and other drainage streams of Suyoc hill occur numerous veins of gypsum,

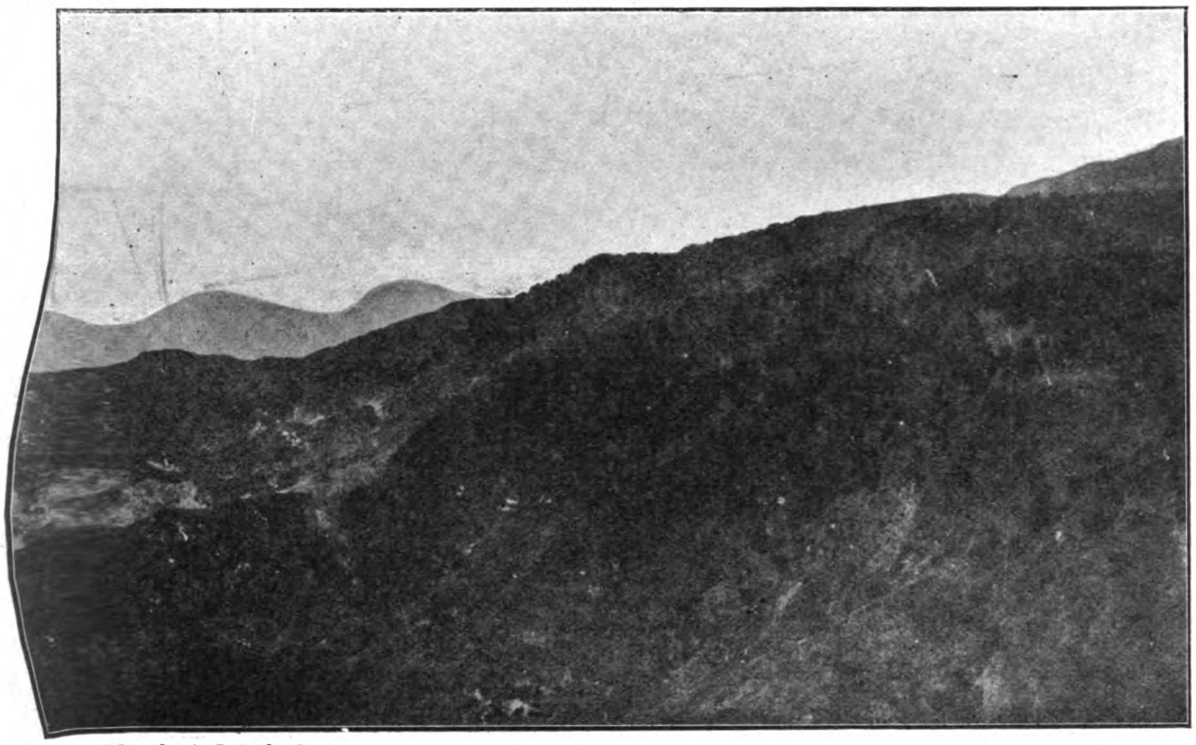


Photo by A. J. Eveland.

VIEW OF THE SEDIMENTARIES IN THE NAPACUAGAN VALLEY

often of considerable extent. These veins are of the fibrous variety, the widest observed giving a length of about 2 or 3 feet to the curved transverse fibers. Some of the rich values of that particular region were, it is claimed, taken from one of these veinlets.

ORE MINERALS.—This heading embraces the minerals of this district, which are generally mined for ores, or value of some nature, although it may be borne in mind that local conditions determine to a great extent just the heading that certain minerals come under. The minerals of this list, unless attention is called to it, have all a metallic luster.

Gold—Comp. gold. Isometric, but rarely showing crystalline form. Usually in irregular particles, filiform dendritic shapes, "wire" gold. Thin plates, rounded edges, and flattened grain or scales. Cleavage none. Fracture hackly. Very malleable and ductile. H.=2.5-3. Sp. gr., 15.6-19.3, 19 33 when pure. Luster, metallic. Opaque in ordinary masses.

In the Lepanto mining districts most of the attention has been directed to the free-gold workings.

At Suyoc, where visible gold is to be observed, the metal occurs in fine plates and grains in small quartz seams, in connection with sulphides of copper, zinc, and lead. The natives work only the free gold and have no knowledge of other values. Farther north the gold values seem to be more closely confined to iron pyrites, and less to the other sulphides. In Mancayan gold values are obtained from both the copper ores of the district and the quartzose vein matter of Mancayan and Tuboc.

Pyrite and marcasite.—Pyrites, "iron" pyrite, "white" iron. Comp. FeS_2, iron disulphide= sulphur 53.4, iron 46.6=100. Isometric, pyritohedral, cube and pyritohedron (pentagonal dodecahedron), octahedron, or combination of these, the common forms, sometimes striated. Frequently massive, and finely granular. Color, pale brass yellow to whitish. Luster, metallic. Opaque. H.=6. Sp. gr., 5. The common sulphide of iron here, as generally in mining districts, is common in all of the ores of the region, and to a greater or less extent present in the rock masses in the vicinity of the ore deposits. In this region the pyrites occur alone, in quartzose veins, associated or not, as the case may be, with other sulphides, and in the Mancayan ore, closely connected with the sulpho-salts of copper which constitute the ore of that region. While, as has been before noted, the pyrite of Suyoc is not worked for gold by the natives, not enough samples of it have been taken to demonstrate that it carries no values. As noted before, it is as yet undetermined just what relationship the pyrite and the gold values have but as this district opens up more information on the point will be obtained, it is presumed.

Galena or galenite.—Lead glance, "lead." Comp. PbS, lead sulphide=lead 86.6, sulphur 13.4=100. Isometric, cubes predominating. Perfect cubic cleavage. Massive, granular, or finely granular, occasionally fibrous. Color, lead gray. H.=2.5-2.75. Sp. gr., 7.4-7.6. Luster, metallic. Opaque. Generally argentiferous.

Galena is, compared with other minerals, not prominent in this region. On the Suyoc area alone it is observed, and here in connection with other sulphides in small amounts in quartz veins. Outside of the Suyoç area the quantity of galena occurring is practically negligible, so far.

Sphalerite.—Zinc blend, blende, black jack, "zinc." Comp. ZnS, zinc sulphide=zinc 67, sulphur 33=100. Isometric, tetrahedral, commonly massive; cleavage granular to compact. Brittle. H.=3.5-4. Sp. gr., 3.9-4.1. Luster, resinous. Color, commonly yellow to black. Transparent to translucent. Occurs in considerable amounts in the Suyoc area, in conjunction with sulphides of copper, lead, and iron.

Chalcocite.—Copper glance. Comp. Cu_2S= copper 79.8, sulphur 20.2=100. Orthorhombic crystals, pseudo-hexagonal, twinning. Massive granular to compact. Brittle. Luster, metallic. Color, lead gray, often tarnished blue or green. Opaque. H.=2.5-3. Sp. gr., 5.5-5 8.

Occurs in the Mancayan area with other copper minerals.

Bornite.—Purple copper ore, peacock copper. Comp., a sulphide of iron and copper, variable (Cu_3FeS_3=sulphur 28.1, copper 55.5, iron 16.4=100). Isometric, cubic. Massive, granular or compact. Brittle. H.=3. Sp. gr., 4.9-5.4. Luster, metallic. Color, copper red to brown, iridescent. Opaque.

Observed mineralogically, with other copper minerals of Mancayan.

Chalcopyrite.—Copper pyrite, yellow copper. Comp. $CuFeS_2$=sulphur 35, copper 34.5, iron 30.5=100. Sulphide of iron and copper, variable, due to admixtures. Crystals commonly tetrahedral. Massive, compact. Brittle. H.= 3.5-4. Sp.gr., 4.1-4.3. Luster, metallic. Color, brass yellow, often tarnished. Opaque.

This is present in variable amounts throughout the district. Generally in quartz veins associated with other sulphides.

Tetrahedrite.—Gray copper. Comp. 4 Cu_2S, SbS_2=$_3$sulphur 23.1, antimony 24.8, copper 52.1=100. Composition variable. Sulphide of copper and antimony. Isometric, tetrahedral. Rather brittle. Luster, metallic. Color, flint gray to tin black. Opaque, translucent (red) in thin splinters. H.=3.4. Sp. gr., 4.4-5.1. Arsenic and antimony are generally present and composition of this mineral is extremely variable. The high percentage of copper in this mineral (approximately 52 per cent), as well as its abundant occurrence in the mine

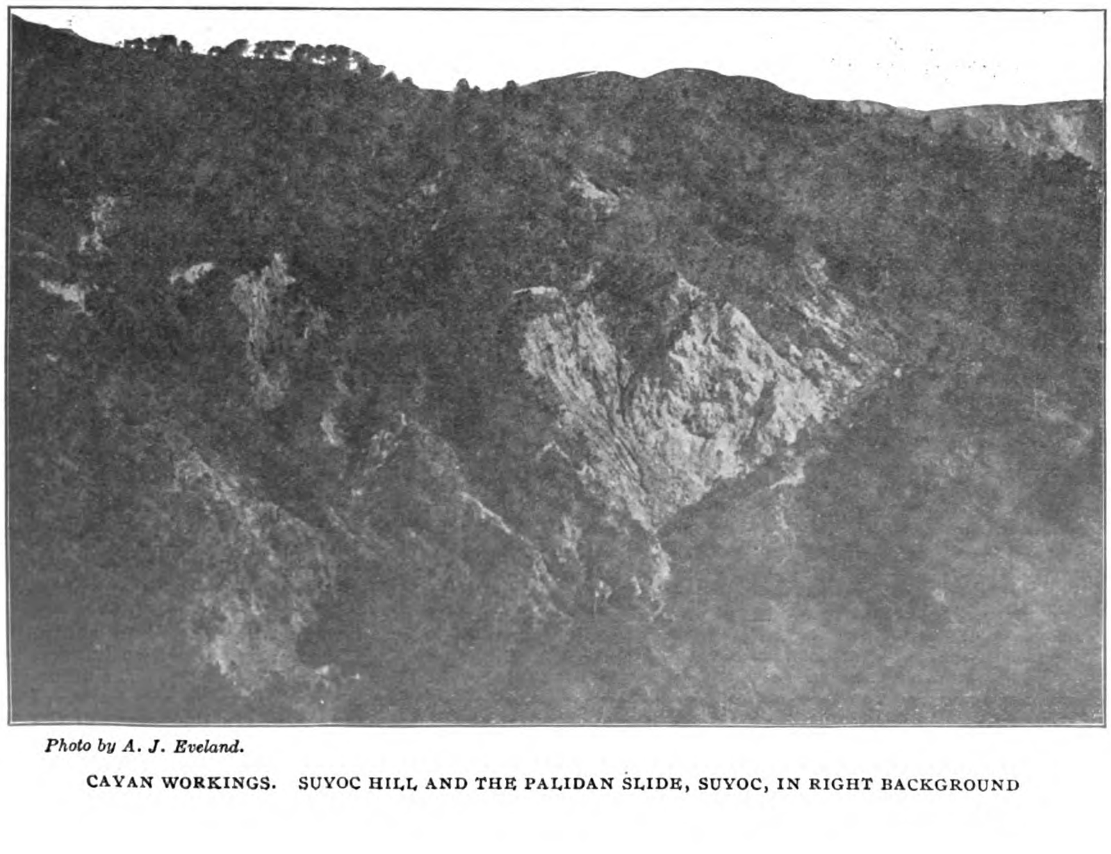


Photo by A. J. Eveland.

CAYAN WORKINGS. SUYOC HILL AND THE PALIDAN SLIDE, SUYOC, IN RIGHT BACKGROUND

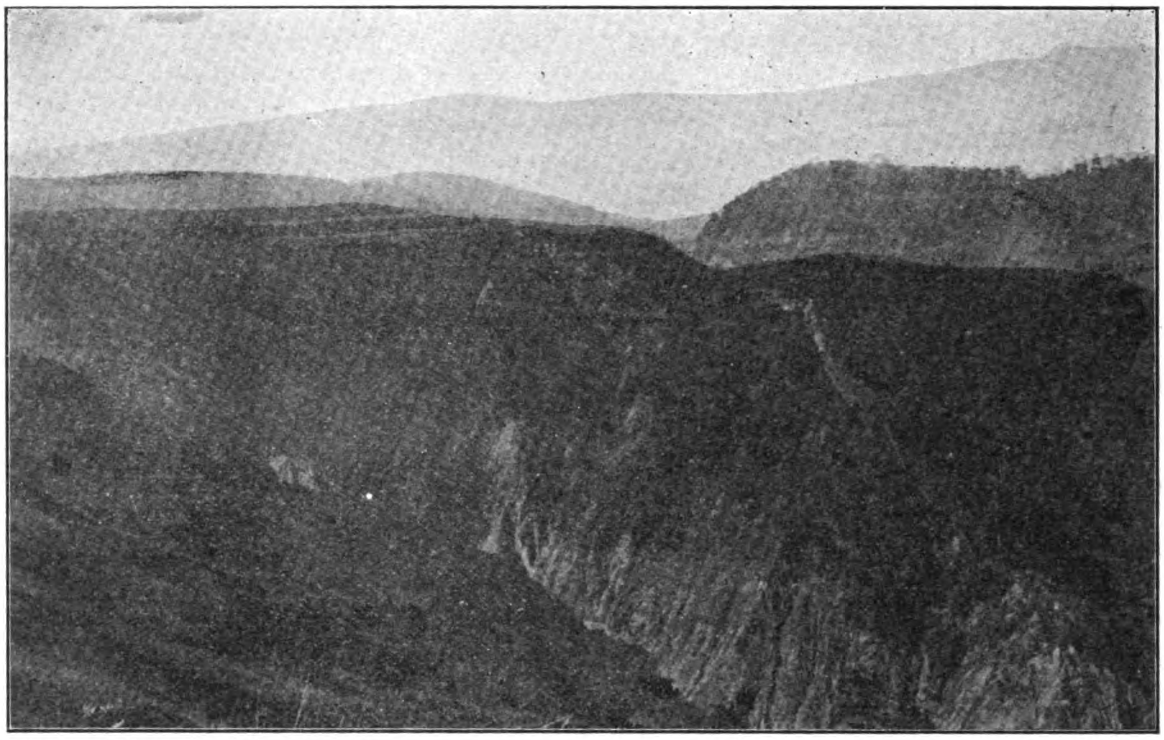


Photo by A. J. Eveland.

WESTERN PORTION OF PALIDAN SLIDE

of the Cantabro-Filipino Company at Mancayan, makes this one of the most important of the region. It is also found in the Suyoc area, on varions claims of that region.

Enargite.—Comp. Cu_3AsS_4, or 3 Cu_2S, A_2S_5 =sulphur 32.6, arsenic 19 1, copper 48 3=100. Orthohombric, crystals usually small and striated. One perfect cleavage. Brittle. H.=3. Sp. gr., 4.43–4.45. Luster metallic. Color, grayish black to iron black. Opaque.

This mineral, as well as tetrahedrite and other copper-sulphur salts, constitutes the greater part of the large ore body of the Mancayan mine. Occurring with this is luzonite, composed essentially as enargite, but differing in crystallization.

Several analyses of the typical ore from the Mancayan mine are given below:

	I.	II.	III.	IV.	V.
	Per cent.	*Per cent.*	*Per c'nt*	*Per cent.*	*Per cent.*
Insoluble residue	......	49.19	55 93	66.72	30.10
Silica	47.06	45.91	45.31	64 53	23.40
Sulphur	24.44	20 36	15.40	12 98	23.58
Antimony (metallic)	5.12	None	None	None	None
Arsenic (metallic)	4 65	2 26	.43	1.80	.40
Iron (metallic)	1.84	14.25	8.98	8.96	11.13
Copper (metallic)	16.64	18.90	16.54	9.72	32.92
Lead (metallic)	......	None	None	None	None
Loss	.25	......	......	......	......
Total	100	99 96	97.28	100.18	98.13
Gold (ounce)	......	0.28	0.16	0.08	0 04
Gold value, at $20.67	......	$4.75	$3.31	$1.65	$0.83

No. I is from Santos's Informe (p. 38) and is given as the mean composition of the different ore breasts of the native workings.

II is a piece of *ore* from the "Carmen" workings of the Santa Barbara mine, Mancayan, selected as typical.

III is a sample taken of the ore the natives (Igorots) use in their smelting, probably from different portions of the Mancayan mine.

IV is another sample taken as typical of the "Santa Barbara" ore.

V is a rounded bowlder of apparently almost pure copper mineral; to the glass it reveals only crystallized enargite, with some very slight amount of quartz and an occasional bunch of chalcocite.

It is not known by whom the analysis was made for Mr. Santos. The analyses numbered II to V, inclusive, are from the Bureau of Government Laboratories, Manila, to which work of this character is submitted.

Another specimen of ore was examined mineralogically by Dr. W. E. Ford, of Yale University, with the following result:

The specimens show the characteristic crystal of enargite in the cavities. They are elongated parallel to the vertical axis and show their orthorhombic character by the shape of their cross section. For the most part the faces are not well developed, the prism zone showing the deep striations characteristic of the mineral. The blowpipe tests agree with those required by enargite.

The most prominent mineral of the specimens is a massive mineral which on a weathered surface has a dull-bronze color, but which on a fresh fractures hows a reddish gray tone. No evidences of crystallization could be discovered. Its fracture is uneven. Its blowpipe and chemical reactions are identical with those of enargite; it decrepitates in the closed tube andgives sublimates of sulphur and arsenic sulphide; with nitric acid and ammonia it gives the deep-blue solution indicating copper. Its appearance and reactions agree with those described for the mineral luzonite.

It seems rather remarkable that none of the four analyses above quoted show any traces of antimony, as between the arsenical and antimoniacal sulpho-salts of copper there is a constant variation and transition, and rarely, if ever, is one known without the other. Santos gives 5.12 per cent of antimony, and it seems highly probable that this better represents the composition of the ore. The analyses, however, are quoted as reported.

Of superficial decomposition products there is in this region but little trace; occasional bunches of iron and copper carbonates and sulphates are found, but only in limited quantities. The geology of the region, as will be shown later, precludes any oxidized croppings of any but occasional veinlets, and, except for scattered points and sections of the underground workings of the old Mancayan mine, decomposition products are singularly lacking.

DISTRIBUTION AND RELATIONS OF VEINS.—Of the ore deposits in the Lepanto area, and in fact in northern Luzon, that of Mancayan has been most known and is most prominent. The occurrence there of copper ore has led to further search in the vicinity, and while the Mancayan deposit is at present far beyond any other locality in size and value, the future may develop more extended masses of ore here or in other localities.

The Mancayan deposit has been uncovered for a long time by the Mangambang (Igorot, meaning "copper") River cutting a deep gorge diagonally across the southeast end of a quartzose mass bearing copper ores. At this place there is a nearly vertical wall of 100 or 200 feet, the strike of which, coinciding approximately with the course of the river, is north west. From mining operations of past years there is a heavy talus and dump pile, and the face of the cliff is pierced by numerous tunnels, some of them mere dog holes, others cut with precision and good workmanship. Several systems of levels explore most of the ore body, the lowest one serving for the purpose of drainage. In the many years of operation of this mine several thousand feet of workings have been made and a considerable amount of ore extracted.

There is no indication of a regular form to the deposit, except that from a tunnel on the west side of the northern extension of the main deposit it is seen that the quartzose mass evidently dips 10° to 15° to the east, resting on the Mancayan diorite.

Much of the mine was flooded at the time of the visit, and without maps of the workings other than the one included in the report which was made of some of the principal galleries, it is only possible to draw general inferences as to the nature of the deposit.

The siliceous mass constituting the outcrop is apparently the same in character as the quartz porphyry described under "Rocks." At the Mancayan mine it loses its lithoidal nature and consists more or less entirely of quartz and ore minerals. The quartz has been previously shattered and jointed in every direction, and the cracks filled with either secondary quartz or ore minerals, notably pyrite, marcasite chalcopyrite, and enargite. The mass at present is hard, compact, and firm, woven through with irregular veins of ore, with no system of distribution. The fissures, broadly speaking, have west-northwesterly and northeasterly directions, and of these the ones striking west-northwest seem to be most prominent as ore carriers.

The fissures would suggest contraction types due to cooling of an igneous effusion, dehydration of a mass, or some similar phenomenon, rather than those produced by dynamic causes. The fracturing has no other pronounced direction than that noted, and even this appears more or less forced.

This fracturing seems not to be confined entirely to the ore body, but is a characteristic of much of the surrounding rock mass. There is apparently no profound fissuring or faulting in the locality, and as yet no evidence is available that other displacement than the local fractures of the Mancayan ore deposit exist.

The "veins" formed by the recementation of the quartzose mass by silica and metallic sulphides vary from finger-breadth cracks to one body (the largest opened) over 20 feet across, of lens shape, of limited depth and length. There is no continuity of these singly, and the workings therefore follow the Spanish method and are crooked and narrow, following rich seams.

Unfortunately for a thorough investigation, many of the galleries were flooded or caved, and the exact relation of the deposit could not be made out. One important observation is worth recording: The lowest tunnel, a regular and large gallery, driven for drainage, has in its present length, and in the side drifts, which are under the greater part of the other workings, no signs of ore—in decided contrast to the rich values of a few feet above; the explanation of this is not certain.

From the nature of the ore masses, it is evident that the enargite and chalcopyrite and some quartz have been formed around the earlier particles of pyrite and quartz. The enargite is well crystallized and undoubtedly later than the pyrite, inclosing the latter.

From the few assays made it would seem to be indicated that the values in gold come from the pyrite, as the assay of a bowlder of almost pure enargite from the mine gives but little value, those samples of which a portion was pyrite showing values up to $5 a ton in addition to their copper content.

In the immediate vicinity of Mancayan there are but few openings of any depth or length, and only negative results are obtained from these. The western slope of the hill is predominantly an outcrop of the quartz porphyry, copper bearing to a mile north of Mancayan mine in variable amounts, and so far as shown decreasing in content to the north. No shafts deeper than a few feet have been sunk over the deposit, or in its vicinity, and these reveal only the soft material derived from the weathering of the trachyte. The tunnels on the east slope of the hill are driven in Mancayan diorite, and when the party left the field were still in that material, so that, except from the Mancayan mine proper, nothing is known of the extent of the deposit.

On the north slopes of Mancayan hill crop two exposures of the same vein, a 2-foot fissure of quartz, heavily loaded with pyrite and some chalcopyrite, the strike of which is east and west. No exploration has been made of this.

South of Mancayan, just west of Tuboc, conditions similar to those of the Mancayan outcrops prevail. There is there a standing face, 150 feet in height, of the same quartzose mass, but the rich ore seems entirely lacking, and the tunnels driven into it to the west so far have not shown other than promising indications.

At Cayan large slides and workings indicate that formerly values were sought, and the quartz-mass outcrops are of a slightly different character. The rock is more cellular in structure and is impregnated with pyrite only. Gold values obtain, and it is stated by reliable authority that these ores were mixed with the Mancayan ores in the blast furnace, on account of their siliceous and pyritiferous character. As the ground is well covered with Spanish pertenencias, no prospecting work has been done of late years.

The ores of the district alter perceptibly as more southerly points are reached, and in addition to the change noted at Cayan, Suyoc and its surrounding territory offer a decided contrast to the Mancayan type.

North of Suyoc, between it and Cayan, the ore-bearing veins are well-defined quartz leads, of small width, generally not over 3 feet, with a content of lead, zinc, and iron sulphides. No general direction of these veins can be traced, but it is the opinion of several of the miners in the district that those corresponding more closely to an east and west strike give the greater values. The length of the veins is limited and no depth beyond a few feet has yet been explored. The "country rock" is here the Mancayan diorite, much decomposed and altered, and the presence of veins of gypsum up to widths of several feet is noteworthy. Several acres of this territory have been cut down rapidly by the combined efforts of the rainy season and the Igorots in their workings, and an enormous slide results, the material being washed down the narrow gorge to join the Maanse River. Every rainy season the Igorots impound this water at the end of long ditches, "boom" away the overlying muck, and obtain a considerable amount of free gold by crushing and panning the vein material. It may be noted in this connection that an assay of the material the Igorot discarded as of no value yielded 0.20 ounce of gold per ton, a value of $4.03. Numerous pockets have been found in this slide that were surprisingly rich, it being stated that 20 *pounds* of metal was taken from one such occurrence a few years ago.

The Suyoc hill deposits, as yet only partially prospected, have the same general character—quartz veins of no great width, carrying metallic sulphides and a considerable gold content, most of it in a free state. In two notable instances, on the "Eureka" claim of Mr. C. A. Pettit and the "Quien Sabe" of Mr. Albert Wright, copper sulphides form a great proportion of the vein filling, and these and the other properties are being developed by tunnels.

All along Suyoc hill, west and south of the Abra River, are large eroded cirques, owing their existence primarily to ancient workings, and all of the same general type.

In view of the fact that the entire region, with the exception of the one ore body of the Mancayan mine, is in an early stage of development, it is impracticable to treat the ore deposits in detail. It seems to be fairly conclusive, however, that the general type of vein in the district is a narrow quartz lead, carrying metallic sulphides, in some cases of copper, and generally with gold associated in a free state. These veins are in the Mancayan diorite which underlies the entire district. With the advent of the trachyte flow, metamorphic changes have taken place, and the nature of the country rock altered to a considerable degree.

It would be rash to enter into a discussion of the genesis of the deposits on the meager data available, and in consequence such will be left to more complete reports that will follow detailed geological work upon a topographic base.

The former attempts to explain the Mancayan deposit have been given and objections to each have been found, and as a mere tentative hypothesis may be suggested a genesis of these ores as yet not considered, that will be determined when further development work is done. It is entirely within the grounds of probability, and not in conflict with any geological evidence so far at hand, to presume that, before the advent of the trachyte flow, ore deposits had been formed in the Mancayan diorite of a type similar to those at Suyoc—quartz veins carrying metallic sulphides and gold values. With the covering of

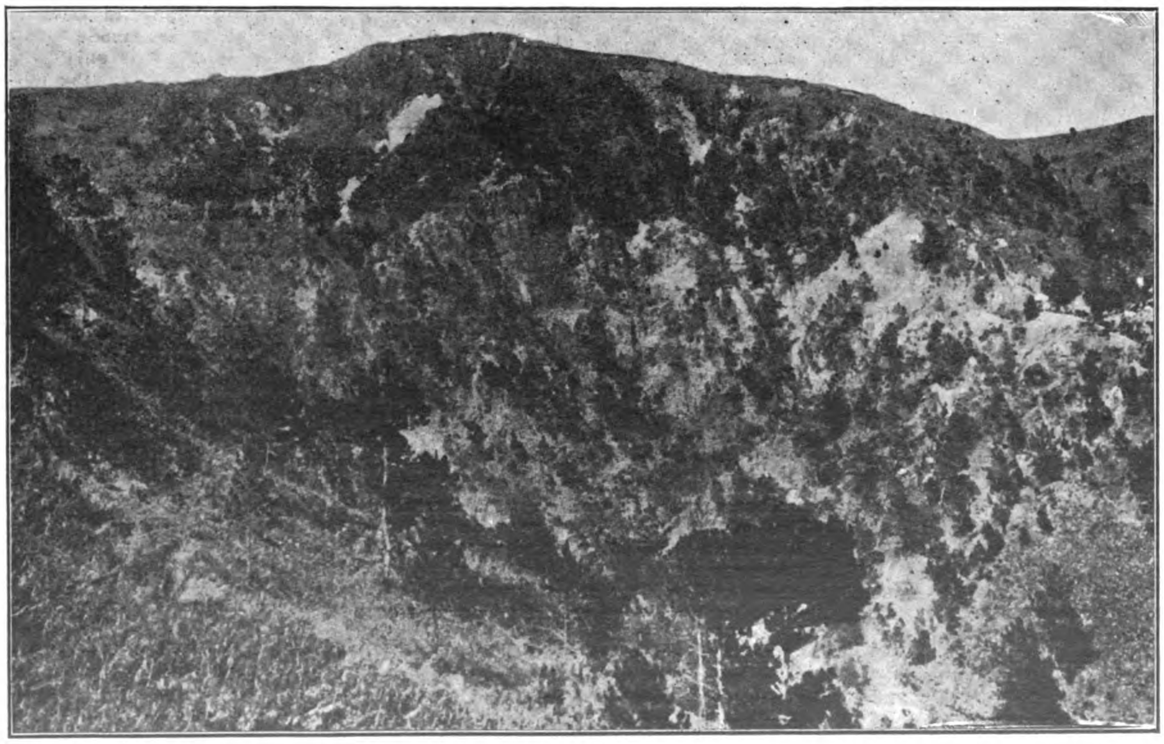


Photo by A. J. Eveland.

ANCIENT SUYOC WORKINGS.

the diorite and its veins by an igneous flow, chemical action was given an added impetus. The trachyte, easily decomposed and altered, was metamorphosed at its contact with the diorite to a hard, flinty, siliceous quartz porphyry, quartz replacing most of the other constituents of the rock. In its cooling and subsequent contraction fissures and crevices were formed, aided possibly by dynamic action, such as shattering shocks, which are a feature of the Islands. The heat of the overlying trachyte furnished a motive power for the process of vein deposition, and the heated waters, assumed to be rising, filled the cavities and cracks with silica and ore minerals obtained from lower or surrounding sources. Enargite is a prominent mineral among those formed by secondary action, and investigation shows that it has been formed later than the other minerals; so that the evidence points to a secondary enrichment of certain portions of the contact, notably at Mancayan, with copper minerals obtained from other sources. Deposition has taken place in all possible directions, leaving the irregular mass of veins of the Mancayan mine.

There is nothing in this hypothesis to preclude the possibility of other similar deposits in other portions of the area, or, indeed, of one or more veins, as yet not opened, in a more or less vertical position, which may occur under the trachyte, in the diorite, and which afforded a main trunk channel for the ore-depositing solutions. Where erosion has been sufficiently deep to cut down near the diorite, such deposits may be revealed, but it is obviously useless to prospect in the trachyte surface, which is easily recognized by its granularity, color, and weathering to a characteristic clayey soil. Deep shafts *through* the trachyte, or proper crosscuts, at a depth easily to be obtained, will afford the only solution of the future of this district, and it is to be hoped that the efforts of those at work will be carried on to completion.

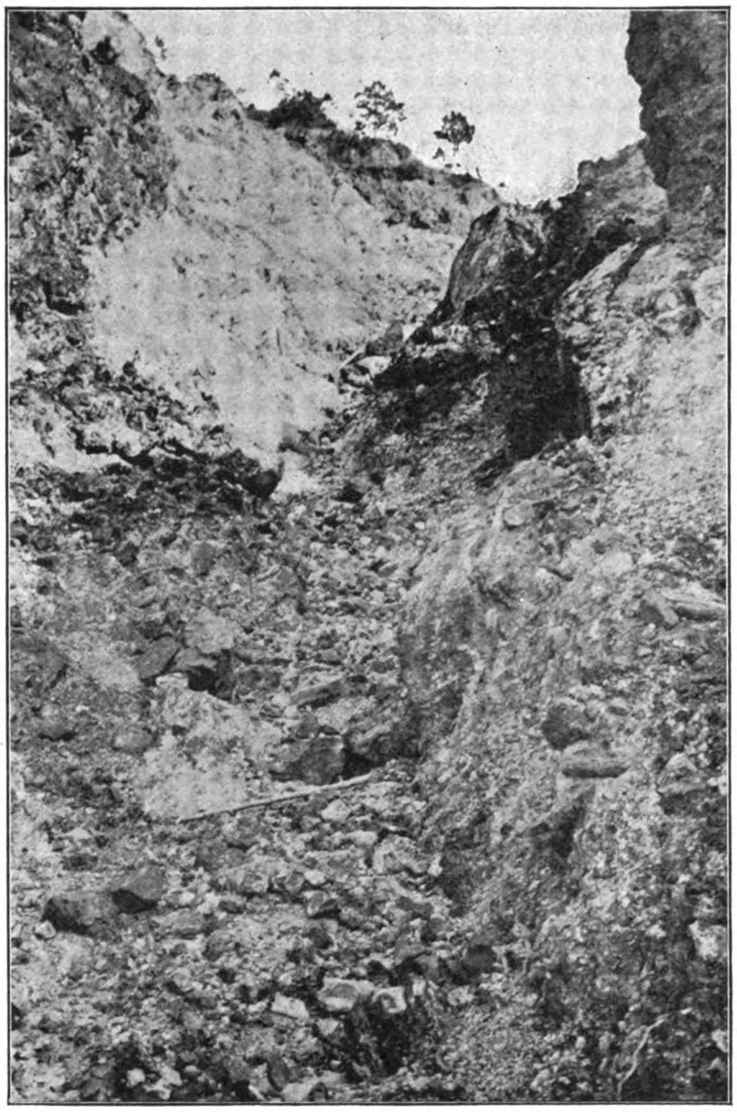


Photo by A. J. Eveland.

OLD NATIVE WORKINGS ON QUIEN SABE VEIN, SUYOC.

GERMAN ELECTRICAL PLANTS IN CHINA

The China Technical Bureau of Siemens Schuckertwerke, under the direction of Mr. Hermann Meyer, M. E., E. E., has been successful in securing many new orders for small lighting and power plants, in the last year.

In addition to the central station plant for the German Concession of Tientsin, Mr. Meyer recently closed an order for a 40 kw. lighting and power plant for the Chinkiang Mint, similar in design to one installed in the Kiangse Provincial Mint by the same firm. The plant for the Canton Arsenal, consisting of a 100 H. P. boiler and 70 kilowatt direct connected generating set, has just been installed. This will supply current for 1000 lamps, and several motors distributed through the workshops.

Another 50 H. P. direct connected set has been erected at the Kiangnan Dock and Engineering Works at Shanghai, and a 35 H. P. lighting set for the Imperial Mint at Tientsin.

One of the most important orders for electrical supplies, recently placed in China, fell to this company, consisting of all the material for the outside construction and wiring for lighting the city of Chinan-fu, capital of Shantung Province. The company controlling the lighting of this city is native, and purchased the boilers, engines and dynamos second hand. The contract for the new switchboard and necessary wiring supplies have gone to Siemens Schuckert.

Other contracts comprise a small lighting plant for the Po Shan Glass Factory, located in Shantung between Chinan-fu and Tsingtao, and the wiring for the new Club Concordia in Shanghai. This handsome building now nearing completion will be lighted by 800 lamps and have electric service and passenger lifts. The library and reading rooms will be lighted by reflection, the lamps being concealed in the cornices and throwing the rays upward to the ceiling.

SOUTH MANCHURIA RAILWAY CO., LTD.

Tokio, June, 15.—The formation of a great corporation for the development of South Manchuria is announced by an Imperial Ordinance in the *Official Gazette*, the object of the Corporation being the working of the collieries and railways of Manchuria.

The Imperial Ordinance gives the regulations for the formation of the Corporations which read as follows:—

Article I.—The Government establishes a company under the style of the Minami Manshu Fetsudo Kabushiki Kaisha (South Manchuria Railway Company, Ltd.) to carry on railway traffic.

Article II.—The shareholders of the Corporation shall be exclusively the Japanese and Chinese Governments and the subjects of Japan and China. No person of other nationality shall be allowed to hold the Corporation's shares, upon which shall be inscribed the names of the holders.

Article III.—The Japanese Government may substitute railway and other property already in its possession in Manchuria as its share of the capital of the Corporation.

Article IV.—The Corporation may issue in instalments shares to the total amount of capital to be engaged from the public, providing the amount of the first issue shall not be less than one-fifth of the total capital to be called.

Article V.—The amount of the first call may be reduced to one-tenth of each share value.

Article VI.—The head office of the Corporation shall be at Tokyo, with a branch at Tairen.

Article VII.—One president, one vice-president, not less than five directors, and from three to five inspectors shall be appointed.

Article VIII.—The president shall represent the Corporation and supervise its affairs. In his absence the vice-president shall act. The latter and the directors will assist the president and control the various departments. The inspectors will act as auditors, etc.

Article IX.—The president and vice-president shall be appointed by the Government with Imperial sanction and their term of office will be five years. Directors shall be appointed by the Government from among shareholders holding more than fifty shares, their term of office to be four years. Inspectors shall be elected at a general meeting of shareholders from among themselves, their term of office to be three years.

Article X.—The salaries and allowances of the president, vice-president, and directors shall be determined by the Government.

Article XI.—These officers, during their term of office, under no pretext whatever, shall accept any other office or engage in any other business without the approval of the Government.

Article XII.—The Government shall appoint officials empowered at any time to inspect the books and the operations of the Corpo-

ration. They shall also be authorized to demand at any time at their discretion a written statement of accounts or of the business of the Corporation; and further to attend and state their views at general meetings of shareholders and other meetings. They will not, however, be empowered to vote at meetings.

Article XIII.—The Government will issue such orders as may be deemed necessary for the control of the Corporation and its business.

Article XIV.—If the Corporation by a vote, or the officials act in violation of the laws or orders of the Government or the objects of the Corporation, or if the Corporation fails to carry out the orders of the authorities supervising the business, the Government will abrogate such vote and may dismiss the officials culpable.

Article XV.—The Government may apply when deemed necessary the laws and ordinances relating to railways in the Empire to the business of the Corporation. Due notice will be given the Corporation of the laws or ordinances to be applied.

Article XVI.—The commercial code and laws and ordinances appertaining thereto shall be applied to the Corporation, in cases where provision is not made in the present ordinance.

Article XVII.—Imperial Ordinance No. 366 (relating to Japanese companies constructing railways abroad) will not be applied to the Corporation.

Supplementary rules have been issued to the foregoing ordinance by which the Government will appoint a committee for the conduct of affairs relating to the formation of the South Manchuria Railway Company, Ltd. The promoting committee shall issue the first shares after drawing up the Articles of Association and obtaining the approval of the Government thereto. After the issue of the first lot of shares the promoting committee shall apply to the Government for a charter, producing the applications for allotment. The committee shall make the first call on the shares without loss of time after obtaining the charter, and the first call having been paid in the committee will call a general meeting of shareholders. Upon the conclusion of the inaugural general meeting the work of the promoting committee will be taken over by the President of the Corporation and the committee be dissolved.

It is semi-officially explained that the Japanese Government cannot properly hold railways and collieries in Manchuria, over which Japanese suzerainty is not established, as in Corea, without prejudicing the sovereignty of China. In the treaty signed at Peking by Baron Komura it is agreed that a company shall be formed, capitalised jointly by the Japanese and Chinese Governments and people, to conduct the Chinese Eastern Railway, after the evacuation of Manchuria by the Japanese troops. The formation of the new company is an outcome of the treaty. It is further stated that the promoting committee will be appointed in a few days, and a valuation will be made of the Chinese Eastern Railway, the Fuchung and Yentai Collieries, and works at Tairen. The capital of the new company will be fixed at Y 150,000,000. The railway and other property held by the Japanese Government in Manchuria will be valued at Y75,000,000, and the Government will take shares in the company to this amount. Shares will be issued for the remaining Y75,000,000, which will be issued for the improvement of the railways, the construction of rolling stock, and as a working fund for the collieries, etc.

Several names have been nominated for the presidency and vice-presidency of the company including those of Mr. Oura, ex-Minister for Communications; Mr. Den, ex-Vice Minister for Communications; Mr. Sengoku, President of the Kiushu Railway; and Viscount Hotta, a member of the House of Peers.

JAPAN'S RAILWAY PROBLEMS IN MANCHURIA

It is evident from accounts received from Manchuria, says a Peking letter, that Japan will have to spend much money on railway betterments before her principal holding is of much value. The first great question, naturally, is whether the Japanese will change the narrow 3′ 6″ gauge to the 4′ 8½″ standard gauge. If they make this change, in addition to all their other expenses, they will have to invest at least £1,000,000 in providing entirely new rolling-stock to replace that which they borrowed from their own railways in Japan.

The first of these, and one of the most expensive, is the replacing the embankments, bridges, culverts, and rails between Changtu and Kungchuling. The Russians utilized the ample time given them by the slow Japanese advance to rip up a 50 m. gap on the railway and to carry all the rails and steel work far back into their own bases. It is this gap beyond the Japanese front which will have to be mended at Japanese expense. From a £250,000 to £500,000 will be necessary for this.

The second expense is the repairing and re-building of stations, and the repairing and improvement of the godowns and railway property. This if carried out along the whole 450-ms. of the main line, will necessitate the disbursement of another £500,000.

The third expense is the completion and improvement of Dalny, which must be attended to, since unless this Russian failure can be turned into a Japanese success within 2 or 3 yrs., it will be a white elephant in the government's hands. This expense then must be entered into without delay. The most conservative estimates hold that another £500,000 will have to be put into Dalny at once and a further £500,000 expended slowly during the next 5 or 6 yrs.

The fourth expense is the development of the railway coal mines. There are three of these mines: The Fushun, the Yentai, and Wafangtien. Of these three, under the Russian régime, the second mine, the Yentine, was the biggest producer, but the Japanese have already shown a strong inclination to push the Fushun mine and to look after the other two very slightly. If they develop the three simultaneously in order to take coal, one of the great articles of freight, a further £500,000 will have to be sunk in machinery and installation of improved appliances.

Thus making the trunk line a standard-line; completing the gap made in the N.; repairing and rebuilding stations and railway property, modernizing the Port of Dalny, and developing the coal mines and giving them improved appliances and rolling stock, will absorb a sum which may vary from £2,000,000 to £4,000,000 according to the thoroughness with which railway affairs are attended to. With all this additional money sunk in Southern Manchuria the Japanese Government will have to strain every nerve to make the railway a paying proposition. How will it act?

Russia spent 160,000 *yen* a mile for the construction of the railway from Dalny at Changchun, a distance of 500 miles. The line may therefore be assessed at 80 million *yen*. Taken together with the prospective disbursements enumerated above, the capital of the railway may be put at 120 million *yen*.

Receipts from the railway will be as follows:—

	Yen.
Freight on beans (amount, 2,510,000 *koku*)	3,200,000
Freight on coal (2,000,000 tons)	8,000,000
Passenger receipts	1,800,000
Total	13,000,000

The running expenditure will amount to 7 million *yen*, so that a balance of 6 million *yen* may be netted as profit. Moreover, the profit from by-works will amount to 1,500,000 *yen*, including a million *yen* from the colliery and 500,000 *yen* from the settlements and warehouses. The total profit will reach therefore 7,500,000 *yen*. Of this sum, 3,200,000 *yen* may be paid as a preferential dividend of 8 per cent on the new capital amounting to 40 million *yen* and 800 000 *yen* put aside as reserves. The balance, 3,500,000 *yen*, will represent the Government's income accruing from the existing railway, valued at 80 million *yen*, the rate of interest being about 4.3 per cent.

There can be no doubt that large quantities of coal will be moved down the line regularly, as soon as the evacuation is complete, and that the export of coal from Dalny will be attempted on a very large scale during the winter months The Fushun mine is at present producing 1,000 tons of coal a day. It is not too much to expect that the various coal mines will be placing 3,000 or 4,000 tons of coal at the pit-heap a day in less than a year's time, and that half of this amount will be available for export. It is quite certain that Dalny will be the principal shipping point, and that coal will flow from here all over the N. Far East. This will be one source of profit.

The large number of trucks which will be constantly entering Dalny will be able to allow return freight of a coarse kind to travel back to the vicinity of Mouken for next to nothing; and therefore people must be prepared to see the Japanese Government offering the very greatest inducements to its subjects to settle in Dalny, and from there to conduct the import trade of Manchuria to the detriment of Newchwang.

Then it must be remembered that at Ta Shih-chiao, Liaoyong, Moukden, Tiehling, Kaiyuan, and Changtu, the government will be able to lease to its own people the immense military godowns constructed by both the Russians and the Japanese places which can be turned into excellent depots for the collection of Manchuria's raw products and the shipment to the seaboard. All this will be in purely Japanese hands and, *pace* the cry of the open door, no others but Japanese need apply for floor space. Japanese banks established at all these centers will give the best possible facilities to their own people, and, therefore, godown-room, financing and goods carriage in her own hands, Japan will attempt to create one of those hidebound monopolies which a study of her present condition shows that she dearly loves.

That, of course, is only one side of the picture; for it remains to be seen how much the competition of the purely Chinese railway on the other side of the Liao River, will tend to diminish the profits of this subtle speculation.

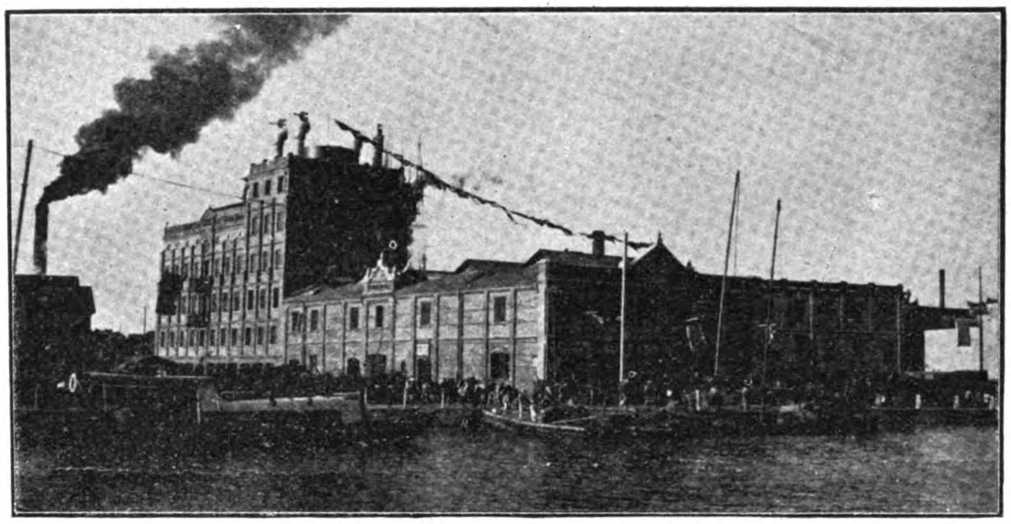
REFUSE DESTRUCTOR HONGKONG —At the meeting of the Legislative Council this afternoon, the following report of proceedings of the Public Works Committee at a meeting held on the 21st inst., was laid on the table and adopted by the Council:—

The committee had before it a scheme for reclaiming an area of land immediately west of Cadogan Street and of Chater Street (extended), and erecting on this a destructor capable of dealing with 100 tons of refuse per day, together with quarters for a superintendent and 300 coolies, the estimated cost being as follows:—

Reclamation of site, including 50-foot road in extension of Chater Street	$160,700
Destructor buildings, including piled foundations, chimney, approach road (incline) and iron boundary fence	98,100
Machinery, including 12 cells and furnaces with fan and engine, two boilers, slab-making machine, tram-lines and trucks, etc	82,500
Quarters for superintendent	15,000
Do. 300 coolies	75,000
Total	$431,300

After full discussion, it was resolved unanimously that the committee are prepared to recommend, in principle, the provision of a destructor for dealing with the refuse of the City of Victoria, but advise that, before any further steps are taken, the makers of the type of destructor which it is proposed to adopt should be requested to send out a representative to investigate local conditions and submit a tender, accompanied by a guarantee for three years, for dealing effectively with 100 tons of refuse per day.

JAPAN SUGAR REFINING COMPANY.—The Board of Directors of the Japan Sugar Refining Company, of Tokio, who are opposed to the incorporation of their company with the Sugar Refining Company of Osaka, as advocated by the majority of shareholders, sent in their resignations *en bloc* at a general meeting of the company on the 18th inst.



YUEN CHONG FLOUR MILL, SOOCHOW CREEK, SHANGHAI

YUEN CHONG FLOUR MILL, SHANGHAI

The erection of a new flour mill in Shanghai for Mr. Yuen Chong has been completed and the building fitted throughout with the latest and most up-to-date machinery and plant. The mill is situated directly facing Soochow creek and occupies a prominent position at the corner of the North Soochow and Winchester Roads. The main building is five storeys in height and has a length of 68 feet, width 44 feet, and a total height of 68 feet, and a large erection at the south end of the mill containing the machinery and cleaning departments. Its length is 44 feet, width 28 feet, and height 72 feet, and at the top a huge water tank is situated for use in case of fire. In the basement are to be found the elevators, main line shafting and the elevators and spouts from the roller mills which are situated on the first floor. The second floor contains the purifiers and on the third floor are to be found the Reliance Sifters, also fan and dust collector for roll suction. On the fourth floor are located the centrifugal reels, scalper, dusters and flour dressers. The top storey contains the elevator heads by which means the wheat is carried direct from the warehouse on the surface and delivered at the receiving separators on the fifth floor. First the wheat passes into the storage bins, then through the milling separators, cockle machine and scourers until perfectly clean and ready for the mill. The grinding is then commenced, the break rolls coming first into use and then the roller mills. The total capacity of the mill is estimated at about 1800, 50-lb bags a day of twenty-four hours. Messrs. Jardine Matheson and Co. have supplied the entire equipment. The machinery for the flour milling was purchased of Allis Chalmers and Co. of Chicago, while the purifiers are of English manufacture, the completed installation being of the most modern, perfect and complete plants that it is possible to obtain and undoubtedly the best in China.

OOLONG TEAS

Former Consul Anderson, of Amoy, has furnished an interesting report to Washington on the manufacture of oolong teas with the object of showing that such teas may be profitably produced in the United States. Mr. Anderson writes:—

It is impossible at this distance to express an opinion of value as to why American experiments in the manufacture of oolong teas have so far been of doubtful success. In the manufacture of tea so much depends upon little things which affect the exact chemical or physical condition of the leaf that even where the leaf itself and the general process itself are the same there may be important differences in results because of very slight variations in conditions. In teas of the hand-cured varieties no opinion but that of experts actually familiar with processes and leaf in both countries concerned can be relied upon safely. It is possible, however, that even a general description of how oolong teas are cured in Formosa may furnish some hints which may be of value in the experiments which are being continued in the United States.

It may be said, in the first place, that Formosan plants used for oolong teas are more rank in their growth as a rule than the Hangchow teas used in the United States for such teas, but possibly this is due more to the climate of Formosa being much more damp and much warmer than the American fields than to any great difference in the plants themselves. The leaf is handled less expeditiously in Formosa than it seems to be in the United States. It is picked by women and children mostly, and as picked it is placed in closely woven baskets, which are sometimes lined with jute cloth.

Curing the Leaves.—Where delivered by the pickers to the curing house, the leaves are spread out in the open air, in the sunshine, if possible, on a bamboo mat or in low bamboo trays, and are there stirred every 5 or 7 mins. until the leaves are somewhat wilted, the edges pliable, and signs of fermentation are visible. The length of time required for this depends upon the sun, temperature, and similar conditions. The tea is then placed in bamboo trays, about 4 lbs. in a tray, which are placed in a rack, one above the other, with enough space between to permit free circulation of air and to enable the workmen to manipulate the leaves. The leaves are stirred up in these trays at intervals of from 7 to 12 mins., as required, the fermentation being regulated and kept as even as possible in this manner. Fermentation ordinarily is allowed to proceed for about 2 hrs., after which a rack of tea, about 40 lbs. of the leaf as a rule, is turned into a large circular bamboo tray and is again stirred and manipulated for 2 hrs. more, at the end of which time the edges of the leaf are somewhat dry, reddish brown in color, and with considerable of the odor of prepared tea.

Firing Process.—The leaf is then taken in lots of 4 or 5 lbs. and placed in metal firing pans over charcoal fires hot enough to wilt and curl the leaf, giving it the soft, sponge-like quality of damp tea leaves and enabling it to be rolled, this firing or wilting being accompanied by rapid stirring and tossing the leaf in each pan. The lot of tea is then turned into a round-bottomed pan fixed in the end of a bench, upon which a workman sits, and the leaf is then rolled by hand to give it something of the form of ordinary country-cured Chinese or Japanese teas. The tea is given a second pan drying, followed by another rolling, and sometimes even by a third drying and rolling, although generally two rollings suffice. This rolling is followed by a drying sufficient to get the leaf in such shape that it can be transported to the export firer. This alternate process of drying and rolling varies with the weather, and indeed the whole process depends upon the conditions surrounding the leaf. The process takes the green leaf, oxidizes or ferments it until the edges turn a reddish brown and the entire leaf is wilted; then wilts the leaf over a fire until it can be rolled to give it form, later drying it for temporary packing. This latter process often includes a light firing in a basket over a charcoal fire.

Firing for Export.—The tea thus prepared for temporary keeping is known as *green leaf*. It is packed in jute bags holding about half a picul, or about 66 lbs., and is transported to the export firer. The leaf thus packed is dry, but it lacks the brittle condition of the tea as it is received abroad, and generally is much lighter in color than oolong as known to the trade. When received at the firing house it is picked over by women and girls for the removal of stems, dirt, or foreign matter generally. The final firing for export is done in bamboo baskets, giving the name of *basket-fired* to the product. The firing which produces characteristic oolong is generally done in a medium-sized room in some of the great brick buildings housing the great tea establishments. In a firing room a brick platform about 20″ high is constructed, in which are round holes about 2′ deep and 2′ in diameter, ordinarily about 1′ apart, and numbering from 50 to 300 or even 400 in an establishment. In each one of these holes a charcoal fire is built and the charcoal is burned until all flame disappears, the room becoming a great furnace into which the coolies rush with covered mouths and nostrils to stir the fires and prepare the little furnaces. When finally the charcoal in each hole or furnace becomes a bed of live coals without flame, it is covered with charcoal ashes to temper the heat and preserve the fire. The entire room is still hot and is maintained in that condition for days at a time. Ordinarily it will require perhaps 12 hrs. to burn the charcoal to a proper condition and have the room at a proper temperature, the covered charcoal giving off a steady heat.

The firing is done in bamboo baskets about 3′ high and a little over 2′ in diameter, open at both ends, and with a sieve placed a little below the center as a bottom. Such a basket is placed over an open furnace or hole in the brick platform, and about 7 lbs. of the green leaf are placed in it. The leaf is practically untouched for about 3 hrs., until the quantity of leaf in the basket has become thoroughly and evenly heated naturally running through a slight wilting in becoming heated. Firers then pass from basket to basket stirring the leaf, so as to keep the drying process even and regular; ordinarily about 1 hr. between the stirrings being sufficient. It generally requires from 7 to 12 hrs. of such firing to thoroughly evaporate all moisture in the leaf, baskets generally being set in the evening and removed in the morning, the tea being boxed while warm. The firing of the tea also varies for the variety of tea desired, heavily fired teas being desirable for some markets because of the darker infusion they give.

Machine Curing not Satisfactory.—Machine curing of tea has been attempted in Formosa, and the Japanese Government is now supporting an experimental machine plant at Anping, Formosa. It is generally agreed by tea men, however, that the results so far have not been successful or satisfactory from any standpoint, and that the plant is run at a loss. There is no present likelihood of the machine method succeeding that of hand firing. The fact is that while, of course, oolong tea derives more or less of its meritorious qualities from the nature of the leaf itself, there is peculiar merit in

the manner in which the leaf is handled and much depends upon little things which a machine can not accomplish. From this fact it may be perceived readily that any description of the process of curing these teas will necessarily be incomplete and more or less unreliable which does not represent the actual experience and work of experts, in this case Chinese workmen.

Since conditions of climate, as well as of the leaf to be cured, vary greatly, it is impossible to pass upon the matter of oxidation or fermentation satisfactorily by ascribing a certain time to a certain process, when, as a matter of actual practice it may require much more or much less time to effect such process under different conditions. Either expert workmen from China or Formosa should be employed in the United States, or American tea men should have a practical training in the processes of making teas in China or Japan, or at least should make a personal investigation of such processes. I certainly see no reason why oolong teas should not be grown and properly cured in the United States with success, since other varieties of tea are being successfully produced.

JAPANESE OFFICIAL INTERFERENCE IN PRIVATE BUSINESS

(Continued from page 36.)

the Government propose to assume the power of suspending the business of a bank, under the pretence of weeding-out the disreputable. When the improvement of the Exchanges is discussed the Government wishes to have authority to make a selection as to brokers and negotiable bonds to be regularly quoted at the Exchanges.

Judging from these and other evidences there is scarcely any doubt, continues the *Jiji*, that the Department of Finance is suffering from an acute form of the bureaucratic malady, and is bent upon extending official authority over every branch of private business, regardless of the partial stoppage of the development of commerce and industry that will inevitably result. It is possible that amongst the banks there are some which are not reputable, and the same may be true of some of the transactions on the Exchanges. The proposals of the Department of Finance to put under control the few which are the object of the proposed legislation, however, will have the inevitable effect of putting to serious inconvenience many business-men whose conduct is above reproach. Herein lies one of the injurious results of Government interference. Unless the Department of Finance rectifies this line of policy, to which it seems to have committed itself, the principal trades and industries of the country will become Government monopolies, while the economic mediums of the country will become subject to the unnecessarily severe supervision of the Government. With the extension of official power in business circles the people will be dissuaded from the promotion of enterprises, and the business and industrial world will be consequently deprived of the life and activity which is necessary for healthy growth. Moreover, it is more than likely that the example set by the Department of Finance will be eagerly followed by other Departments in enlarging their spheres of influence. Thus there will be no end to official interference in private affairs, and the expansion of administrative business.—*Japan Chronicle.*

THE FUJI PAPER MILL COMPANY proposes to erect a new mill in the Hokkaido and to introduce great improvements in the existing mill at the base of Mount Fuji. The cost of these improvements is estimated at $775,000, and the cost oi the new mill at $161,000. For this purpose debentures will be issued to the amount of $1,000,000, with interest at the rate of 5.7 per cent per annum, to be redeemed in fifteen years. This issue will be undertaken by the Japan Credit Mobilier (Limited). The company further proposes to increase its capital from $1,650,000 to $2,300,000.

BRICK TEA FACTORY, MONGOLIA:—It is reported that certain Russians have entered into partnership with some Shansi tea merchants to start a factory at Kiachta, Mongolia, for the purpose of making brick tea.

BRIGADIER GENERAL C. R. EDWARDS,

CHIEF OF BUREAU OF INSULAR AFFAIRS

GENERAL CLARENCE R. EDWARDS

The passage of the Bill promoting the Chief of the Bureau of Insular Affairs to the rank of Brigadier General is a just tribute to faithful work, and a special reward for the services rendered by Captain Edwards in his capacity as head of this important department.

The Bureau has risen to its present enviable standing in Washington through the untiring zeal and attention to detail on the part of its chief, and today it stands as the one sole bulwark of the Islands against our political enemies in Washington. The success of the various measures introduced in Congress for the betterment of conditions in the Philippines, has been due in large part to the valuable assistance rendered the Secretary of War by General Edwards and his assistant, Captain Frank L. McIntyre. To his excessive attention to our interests is traceable the malady, which at last forced General Edwards to Arizona, in the endeavor to regain his broken health.

ICE PLANT, CANTON:—The Canton-Hongkong Ice and Cold Storage Co. have begun the erection of their factory at Canton. The first ground was broken a few days ago, and the work will be pushed through rapidly to completion. The contract is in the hands of The Oriental Construction Co , Ltd.

SALT WORKS, MANCHURIA:—Abe Rinyemon, a merchant in Tokyo, who recently returned from a tour in Manchuria, has established the Manchuria and Korea Salt Company, with a capital of $250,000, to manufacture salt on the coast at Pitzewo and Pulantien.

NEW ARSENAL, TIENTSIN:—A new arsenal is to be established at Tientsin by the Viceroy, and the representative of one of the largest German firms is there with a view to obtaining the contract for construction, which will amount to some three million Taels.

NEW BUILDINGS, TIENTSIN:—The new building at the end of Canton and Bristowe Roads which is being erected for the Tientsin Iron Works is rapidly nearing completion.

PAPER MILL, TIENTSIN:—It is stated that a scheme is on foot in which both foreign and Chinese capital is included to establish in Tientsin a mill for machine made paper, and that the site will be cn the north side of the City.

TIENTSIN WATERWORKS CO:—The annual meeting was held on the 25th ult. The net profits for the year ended the 30th of April, including Tls. 1,012.61 brought forward from last account, amounted to Tls. 18,836.38.

ELECTRIC POWER SCHEME, COREA:—An application made by Baron Shibusawa and eight other Japanese capitalists for a concession for the establishment of a Company to utilize the waters of the rivers Tatong and Ham for the generation of electric power has been granted by the Corean Government. The term of the concession is twenty-four years, and the Government is to receive five per cent of the net profits.

TOKYO STREET RAILWAY CO.:—The net profit during the first half of the present year amounted to 467,370 *yen*.

KOBE MUNICIPAL IMPROVEMENTS:—The Kobe Municipality proposes to raise a loan of Y 1,000,000, to be utilized for the construction of a new infectious diseases hospital, a refuse destructor, the reconstruction of the city office, improvements in the drainage system, and the redemption of existing loans.

PHILIPPINE TARIFF BILL

Argument by Mr. GEO. BRONSON REA, before the Senate Committee on the Philippines.

Mr. REA. In the hearings before this committee the question involved in the proposed bill has been treated and discussed from all its view points, except one. We have listened to its elucidation from the ethical, economical, legal, constitutional, and industrial standpoints; in fact, from every phase except the most important one, and I am going to request the indulgence of the committee while I try to present the issue from the practical standpoint and show the fallacy of the other contentions and leave the real issue clear in your minds.

I think it may be taken for granted that the opposition to the passage of this bill arises from the fear of our home sugar and tobacco interests that it will seriously retard the growth and eventually swamp their own industry, and that if it could be proven to their satisfaction that such a menace does not exist tl.ey would be willing to withdraw their opposition and allow the bill to pass.

These men are undoubtedly actuated by the most honest and conscientious motives in defending their interests, and fully believe their side of the argument. The protection of our home industries is, according to their view, one of our first duties and concern, and from their standpoint their opposition seems entirely reasonable. In pleading for the cause of the Philippines and for the passage of this bill, I would like to state that as an American sugar engineer my first sympathy and friendship is with those with whom I have been connected and with whom, in the course of time, I must have further business relations. The sugar world in the United States is a relatively small one, and all new sugar enterprises invariably secure their original support from a very limited circle of capitalists, and to this same small combination the Philippines will have to turn to for the capital to exploit the industry if this bill passes.

If I honestly felt that our home interests were being menaced, and there was any possible chance of their being swamped by Philippine competition, I would not attempt to favor the bill, even though I represent Philippine interests. But I am convinced, after a most careful study of the question on the ground, that this so-called menace does not exist, and, taking into consideration the increase of cosumption in this country, the Philippine crop could never constitute a real obstacle to the development of our home industry.

The tendency of everybody interested in this legislation is to be fair and just, and to carefully weigh all the testimony presented. In the testimony before the Ways and Means Committee, in the various speeches on the floor of the House, and in the hearings before this committee it has been repeatedly asserted that this menace does not exist at the present time, but is a condition which may arise in the future. The entire question and issue deals with future conditions. The arguments brought forward to bear out these prophecies are based on many conflicting and contradictory assumptions, and, without going into these in detail, I wish to assume for the moment that these prophecies are correct. Let us grant that they are liable to come true. Now, gentlemen, if you take that viewpoint from our side of the case, it is certainly fair to ask you to take the same view of the future of the home sugar industry.

The testimony submitted by the honorable Secretary of War, Mr. De la Rama, Mr. Welborn, the governor-general, and myself, gentlemen who have been for some years in the islands and conversant with conditions there, has been opposed by the testimony submitted by Major Gove and Mr. Hathaway, who have both made a short superficial investigation of our industry, seeking for points to prove their own side of the case. Their testimony has been supplemented by statements from Mr. Humphrey and Mr. T. G. Palmer and others, none of whom have been in the islands.

Now, the undoubted head of the opposition is Mr. T. G. Palmer, who has so ably and successfully championed the cause of the beet-sugar interests here in Washington for some years as secretary of the American Beet Sugar Association. Mr. Palmer tears to pieces the statements of those who have lived in the islands, and proves his case with apparent ease and conviction. He "stands pat" on his forecast of conditions in the Philippines, and I am willing, for the sake of argument, to allow he is correct, but I also assert, gentlemen, as a matter of justice and fairness, appealing to you as a judicial body, that when we assume his infallibility on the future of Philippine conditions, which he knows only by hearsay, we must also admit his absolute infallibility in forecasting the future of the beet-sugar industry, which he is so intimately connected with as secretary of the association and chief advocate in Washington.

Now, Mr. Palmer, as the mouthpiece of the opposition, would have it that, while his predictions in regard to the Philippines must be accepted, we must reject his forecast of the beet-sugar development and the lowering of its cost of production. I do not think that this is fair. If we assume he is right in regard to the Philippines we must also assume he is right in regard to the home industry, and if we disregard his predictions in one case we must also, in fairness, reject his argument in the other. Either he is right in both cases or he is in error in both.

I think this is a fair stand for us to take in considering the merits of both sides.

Now, what do we find in the case in regard to the development of the home industry that is menaced by the passage of this bill? What does Mr. Palmer have to say about this phase of the situation? Let me call your attention particularly to that part of Mr. Palmer's pamphlet relating to the future cost of production, etc.

I would like to quote from page 292 of the record and have it incorporated in my statement, simply as referring to the ultimate cost that Mr. Palmer prophesies at 2 cents a pound:

> I take it that further Philippine tariff reduction is likely to come in due course of time, but it should not come until the Philippines greatly raise their wage rate on sugar haciendas and become at least semicivilized, and until the brains and capital already engaged in the home industry, and which will come to it under favorable circumstances, if let alone, enable us to perfect the various improvements now under way.
>
> Two years ago I wrote you at length concerning my suggestions of producing single-germ beet seed. The work was begun immediately by the Government, and the first crop of seed from beets grown from 2,500 selected single-germ beet balls has just been harvested. I understand that 30 per cent of this seed came single germ, and the expectation is that in four to six years more it will be an established thing, saving the farmers $6 per acre of actual labor, eliminating the hand work of thinning on hands and knees, and at least doubling the tonnage per acre on account of no injury being done to the remaining beets by hoeing out the superfluous ones, each plant standing 1 to 3 inches apart, depending upon how closely the seed is drilled in. If the sugar beets which the farmer now sells to the factory at an average price of $5 per ton cost him $3.50 per ton to produce, his crop grown from single-germ beet balls should not cost him to exceed $1.50 a ton.
>
> The Government has taken charge of the scientific work on one of our sugar-beet seed farms in the State of Washington, and expects to be able to produce a strain of seed as high in sugar content as the best beets selected at the outset, which is 25 to 28 per cent. These mother beets should give factory beets of 23 per cent sugar, and, with a loss in extraction of 3 per cent, would enable the factory to turn out 400 pounds of granulated sugar per ton of beets. According to the Government report on the home-sugar industry for 1902, the average amount of sugar extracted per ton of beets was 221 pounds; hence this anticipated extra production ot 170 pounds would nearly cut in two the present factory cost of producing sugar from American grown beets.
>
> Doctor Wiley, chief of the Bureau of Chemistry, Department of Agriculture, is to experiment this coming month with sugar "concrete," and, if successful, each factory, by increasing its investment 25 per cent, can operate three near-by "concrete" plants, shipping in the "concrete" to the main factory after the local campaign has been concluded and thus operating the year through and quadrupling its product, which would greatly lessen the cost of production.
>
> Experiments are being made this year with an invention designed to remove the impurities of the juice at the outset instead of from the waste molasses after coming down through all the various processes, the inventor claiming that it will reduce the cost of a beet-sugar plant by 50 per cent, the labor to operate it by 33⅓ per cent, yield an average excess of 20 pounds of sugar per ton of beets, besides saving several valuable by-products.
>
> All these matters lead to an eventual cost of production of granulated sugar from American grown beets of something like 2 cents per pound, but it takes not only money and brains to perfect these improvements, but it takes time.

Now, I contend that this point is the most important and significant that has been brought out before these hearings, and too much stress can not be laid on it. Either Mr. Palmer knew what he was talking about or he was intentionally misrepresenting the situation for certain ends. In either case his statements should be carefully weighed by this committee, for in that statement he has fully answered his own case, and conclusively discredits all his predictions about the Philippine menace.

If we accept Mr. Palmer's present intimation that he made an error when he wrote that pamphlet, or his repudiation as an expert by his Michigan brethren, and assume his predictions can not be fulfilled for some years at least, then, gentlemen, I think, in all fairness, that you can safely decide against the opposition to the bill.

If he was right in his statement, then there is nothing to fear, and if he was wrong, then we may assume that it was written with the express purpose of representing the situation to foment opposition to this bill.

The object of that pamphlet was to awaken the beet-sugar interests to a realization of the supposed menace implied by this bill, to quicken their interest in the legislation in Washington, and to force them into action to defeat it. The pamphlet deals with the situation from their biased viewpoint, attacking the motives of the Administration in regard to the islands; questioning the integrity of the honorable Secretary of War; characterizing the friends of the measure as exploiters and bad friends of the Filipinos; grossly exaggerating the situation in the islands, and then, to further awaken their interest, he appeals to their cupidity and dwells on the golden outlook for the home industry, specifying in so many words the number of years in which they may reasonably expect to make their sugar inside the tariff wall for 2 cents a pound. He then holds out the threat of the "big stick," which will be employed to force our legislators to do their bidding, and finally concludes with an earnest appeal to all those interested in the industry to write letters to the President, Vice-President, Senators, Members of Congress, and the leading "stand-patters."

The pamphlet has accomplished its work; alarmed at the menace so skillfully painted by Mr. Palmer, and enthused by the brilliant forecast offered for their own industry, the prospect of making sugar at the lowest price the world has ever seen, is it any wonder that a great sentiment has been created in opposition to the bill and letters from all over the country have poured into Washington in response to Mr. Palmer's suggestion? How many Congressmen and Senators have received these letters, influencing their attitude against this bill?

Now, gentlemen, we must acknowledge that this great sentiment in opposition and the receipt of all these letters is a direct

outcome of Mr. Palmer's appeal to his constituents and should receive the consideration of our legislators accordingly.

But if we now accept Mr. Palmer's statement that his glowing prediction as to the future of the beet-sugar industry was based on his imagination, then we find that he has misrepresented the case to his constituents, and therefore the sentiment created against the islands was the result of such misrepresentation, and the letters to Congressmen, Senators, and public men were also influenced by these misrepresentations and in due justice and fairness to all concerned should be rejected as not having any material bearing on the case.

But I have taken the stand, for the sake of argument, that this menace will come, and in allowing this I have also contended that in fairness we assume the correctness of the beet-sugar future.

Suppose that capital was waiting for this bill to pass to invest in sugar lands in the Philippines, how long would it take before the first crop could be taken off? Exactly three years. Now it is undisputed that no capital is obtainable in the Philippines for the development of the sugar industry. The banks refuse to advance money on the security of the lands. This is the only security the native planter has to offer for a loan, and the money lenders refuse to advance on it, for in the event of foreclosure the loan can not be realized by the sale of the lands. Most of the plantations are already mortgaged to the limit and have not paid the interest for years. Instead of foreclosing those mortgages, the money lenders find it more profitable, though more hazardous, to make further loans at a higher rate of interest on the crop. These high rates of interest are not understood here, and the impression is that the planter is being robbed, yet the system is based on good sound business principles. If the lands have no value or can not be sold to advantage when foreclosed, a mortgage on them is worth little, and when money is advanced on the crop it is simply a gamble. The money lender, on advancing a large amount for planting and crop purposes, has absolutely no guarantee except the good faith of the borrower, for if dishonest he can divert the money into other channels—which is often the case—in gambling and high living and only a small proportion goes into the enterprise. If the season is good and prices high, a profit may accrue from the crop, but there are even chances for the reverse.

Now it can readily be understood that under such conditions there is little hope of the native planter securing any large amount of capital to improve his place. On the installation of modern machinery hinges the question of whether the present crop will increase. It has been asserted by the opposition that on the passage of this bill the mills in the Philippines will, by the installation of modern methods, double their output in sugar in a couple of years, and while the fundamental fact is feasible in some localities I wish to prove that the present establishment can never hope to develop along these lines and that any great increase in our crop must come from the investment of outside capital.

The average plantation in the islands is so small that the owner could not, with his holdings, accomplish anything by a modern equipment, as the limited land area and size of crops is not capable of keeping one going, and his inability to secure money in the local market is another deterrent factor.

Let me cite you an instance of a fairly modern equipment installed in the islands. On the estate of Mr. Lacson, near Bacolod, in Negros, is installed the following machinery: One 80-horsepower 6-foot mill capable of grinding about 25 tons of cane per hour, two large open-kettle trains, and several centrifugals.

This is the most modern equipment in the islands, yet with his cane acreage of some 200 to 300 acres, the scarcity of help and work animals, they could not keep the mill going for more than one hour or so at a time, finally abandoning this plant and now grinding the cane in a little water-power mill in another corner of the estate.

So it is quite impracticable to expect that any of the present plantations will be able to develop their properties to the extent of increasing their yield, first from lack of capital and inability to secure it, and secondly, from the limited acreage, which makes it unprofitable.

I must also add that the present factories and mills with their equipments are all so old as to be almost worthless as an asset, and have no value except as old iron, and in changing the house around for a modern equipment everything would have to be thrown away and a new house erected. There is not a factory in the islands that admits of being improved or new machinery added to bring it up to modern practice. Not one piece of machinery now employed could be utilized in doubling or improving the output. There is not a mill house or structure in the islands capable of holding such improvements, and so we can readily see that entirely new plants will have to be erected and installed and operated on a central factory basis before any great increase in the crop will occur.

The central factory scheme is the only solution to existing conditions, and to secure this we are absolutely dependent on outside help and capital. The installation of such factories is a question of time and patience. It is not an easy matter to secure the right conditions to make such a venture profitable. In the first place we have to assume that the capital is ready to embark in the enterprise; then comes the question of assuring its continuance as a profitable investment. A central factory need not own any land, but simply confine its operations to the manufacture of the sugar from the cane, paying for the raw product at so much per ton, a percentage in sugar on the weight of the cane, or by the percentage of sugar in the cane. A fair-sized factory would cost, with the necessary land, railways, and rights of way, from $300,000 to $500,000, or to $1,000,000, according to its capacity. Before any attempt can be made to consider the matter seriously certain guaranteed contracts with the farmers for the supply of cane for a number of years have to be secured. The farmer is guaranteed that his cane will be ground by the erection of the mill, but the mill owners must have the guaranty that the cane will be forthcoming before the factory is erected, and the only guaranty worth anything under such conditions is a mortgage of the lands.

In dealing with a race naturally suspicious and distrustful as the Filipinos this guaranty is difficult to secure, and experience has proved that it will be uphill work to make a start. One of the ablest sugar men of the Hawaiian Islands spent some months in the Philippines trying to secure the necessary guaranties for the delivery of cane, preparatory to the erection of a central factory, but had to finally abandon his labors, as he could not overcome the distrustfulness of the natives. The development of the central factory system, as in Cuba, is a slow process, and only comes with perfect understanding and confidence between all parties. For years they have been agitating this question in the British West Indies as the only hope of saving the decadent sugar industry, but as yet no actual headway has been made, as the average planter is unwilling to lose his identity as such and be relegated to the farmer class, preferring rather to struggle along with his old one-horse outfit making muscovado sugar than to enter into an arrangement which loses for him his former status of planter in the community. In a country where for centuries this class has lorded it over the natives, modern ideas of combinations are slow to take root, and it is especially true in the Philippines.

In Cuba the great central-factory system is the gradual outcome of years of development and competition between the planters, and of the two hundred or more centrals now in operation, not more than a dozen were originally built as such.

So, while the erection of central factories in the Philippines is the one hope of infusing new life in the industry, it will be readily seen that this desired end is surrounded with many difficulties, and the capital must be forthcoming from the outside. American capital will be slow in going to the islands, even with the inducements offered by free trade, for its great distance from our financial centers is an obstacle in getting investors to look over the field. To the assertion of the opposition that capital will flow into the islands on the passage of the bill, I would like to respond with the query, how much capital has flowed into Porto Rico since free trade was granted? Even with the most alluring prospects of free trade, good soils, and abundant and cheap labor it is a fact that only two large American central factories have been established there—the Central Aguirre and the Guanica Central.

Just previous to my departure for the Philippines I spent four months in Porto Rico securing the necessary contracts and options for the establishment of a central factory in the most fertile and favorable district of the islands, or between Naguabo and Humacao, yet it was an impossibility to float the company in New York at the time, and it has taken two years to get the necessary capital together to make the venture a success and erect the factory. To make good the prediction of our friends of the opposition as regards the islands means that the farmers are anxiously awaiting the central factory promoter, and that millions of dollars are ready to go into the country, when as a matter of fact the opposite obtains.

In connection with this phase of the situation I would like to refer briefly to Senator Newlands's proposition to establish a Government agricultural bank as a means of building up the sugar industry and placing it in a position to lower the cost of production and compete with the world's price of sugar. This scheme, which would be practical when dealing with minor agricultural crops, fails when applied to the sugar industry of the islands in its present condition. If the industry was further advanced and the mills in shape to be enlarged, and of sufficient value to serve as an asset, the scheme would work out, but with the most rudimentary methods and machinery, which would have to be discarded at the outset of the development, the plan is not a safe one. As I have already stated, there are few plantations with sufficient acreage to warrant the installation of such machinery. These holdings, averaging, say 500 acres, though the real average is only 136 acres in cultivation, are sufficiently large for a little 8-horse-power primitive outfit, making a crop of, say 200 to 300 tons, and giving a fair living to the owner. The value of the lands at an average of ₱40 per acre would be ₱20,000, but no bank or money lender is willing to risk a loan exceeding, at the very utmost, one-quarter of this, so it is plain to be seen that with the creation of such a bank it would be impossible to loan out at good security sufficient money to install any modern machinery that would greatly increase the yield of sugar over the old process. Five thousand pesos is not a large amount for machinery; it wouldn't be enough for the foundations.

Such a bank might take up the bonds of a central factory company, thus insuring the necessary capital, but even here the mortgage depends on the assets of the company, as to lands, contracts, options, etc. The apparent success of such an institution in helping the sugar industry would be in loaning out money to the small farmers, etc., contracting with the central factory, but here we again strike the difficulty that they have to take a second mortgage, as the first is given to the central factory company as a guarantee for the delivery of the cane, and the rule in Cuba and elsewhere in this system is that the central factory must also assume the functions of an agricultural bank., loaning out money to the farmer to plant, cultivate, and harvest his crop. To be successful a bank would have to maintain an elaborate system of inspectors to see that their loans were really expended in the fields, while the custom under a central factory is to facilitate certain sums to the planters after

the work is concluded, to be repaid during the crop at usual rate of interest.

As the factory has the guaranteed contract for the delivery of the cane to itself, it is doubly secured and simply deducts the value in sugar at the expiration of the crop season.

So with the creation of a central factory system, the operations of an agricultural bank, would be practically rendered useless, as instanced in Cuba. The bank can not guarantee or insure the establishment of the factory system, which is necessary to the real development of the industry, and under existing tariff conditions capital will not embark in the factories, and only under the provisions of this bill can we hope to induce the necessary capital to enter the islands. This system, of course, is only applicable to the lands in Negros, where there are sufficient planters to insure its success.

In the other islands, where there are no plantations at present, or where cane is grown in small patches, any great development of the industry must depend on the erection of large plants and the company also own their own acreage and cultivate its own cane. This condition is one beset with difficulties at the very outset, for the land law which limits the holdings of a corporation to 2,500 acres is a serious obstacle to the successful floating of a company. A fair-sized modern mill of to-day should have a capacity of 10,000 tons of sugar. To secure this result it would be necessary to hold 5,000 acres in cane lands, 1,000 acres in pastures, 1,500 acres in railway lines, timber, etc., and as the lands become exhausted, new lands have to be purchased to keep up the normal capacity of the mill, or, in brief, it would need something like 7,500 acres of available land to insure a crop of 10,000 tons of sugar.

Right here I may say that it is impossible to secure a continuous acreage of 7,500 or 10,000 acres, all of which could be available for cultivation without including several thousand acres of waste lands, such as hills, rocky lands, swamps, etc., which could not be placed under cultivation, but which would have to be purchased to secure the other acreage, thus raising the average considerably. Mr. White, of Hawaii, who recently spent some months in the Philippines studying our lands, gave it as his opinion that no Hawaiian capital would invest unless 25,000 acres at least could be controlled by the factory.

The present land limit of 2,500 acres practically confines an enterprise to 3,000 tons, or only 1,500 acres in cane, as it will require 500 acres in pasture and the balance in timber, roads, etc. This is also assuming that a crop is produced once a year, while as a matter of fact, under present conditions on the older lands, a crop is secured only once in every two years, which decreases the limit of such a holding to a crop of 1,500 tons and the necessary limit for a large company to 12,500 acres. Under such conditions it is folly to assume that capitalists will be attracted to the islands, for a modern mill, to be operated economically and secure the maximum results, must have a large capacity and the most powerful mills and apparatus.

There is another feature to this phase of the question. It is an accepted fact that it is difficult to get the Filipino to move away from his natal province, and any attempt to foment the sugar industry on the islands of Mindoro, Mindanao, or Samar would be checked at the outset by the difficulty of securing labor. It is also conceded that those islands are the most promising of the archipelago, but for the above reason they must be eliminated as a field of development for the present generation at least.

I think that rather answers the statement that was brought out here the other day about this vast track in Mindoro. It may be there, but, gentlemen, I assure you it will be there fifty years from now, uncultivated. There is no labor there, and it is very difficult to get it there.

Another great difficulty to the successful floating of a large sugar company is the absolute lack of experienced and skilled mechanics and labor in the islands. Every employee, aside from the unskilled labor, would have to be imported, and under our laws this means they would have to come from the United States, or, in other words, from Hawaii, Louisiana, or Porto Rico. Managers, assistant managers, engineers, chemists, sugar boilers, defecator and triple-effect men, locomotive drivers, field superintendents, and others would have to be supplied from outside the islands, as there are none there to fill the billets.

We have not a single skilled mechanic or trained man in the islands that we could put to work in a modern factory to-day, not even an engineer. There is not one who knows how to set a mill knife.

This means that they would all have to be employed under contract at a higher scale of salary, and their expenses both ways guaranteed, raising the rate at least 25 to 50 per cent over current wages. We have to do this, as it is done in sending sugar-house employees to Cuba, Porto Rico, Santo Domingo, Mexico, etc., and it would also pertain to the islands. Now, skilled sugar men are scarce and difficult to secure and command large salaries, and anyone who contemplates investing in the islands must confront this at the outset. There would be no difficulty in securing the necessary men for a few factories, but it would be out of the question to supply any great number without offering such great inducements as would considerably raise the cost of production.

All these are serious obstacles to the rapid development of the sugar industry in the islands, as viewed from the inside by a competent and experienced expert in the trade of the Philippines. Still assuming that Mr. Palmer's forecast is correct and viewing the situation from the stand of the capitalist, we find as Mr. Palmer contends:

> We can offer the Philippine Islands a perpetual market for nearly $200,000,000 worth of purely tropical products annually. But whatever magnitude their sugar industry may reach, those who put their money into it will some day be compelled to fight a battle royal with the educated, scientific American farmer which will be costly for both and ruinous for one. Never in the history of the world has the nervous energy of the Temperate Zone succumbed to the listless workers of the Tropics, and it remains to be seen whether or not the sugar industry is to furnish the exception.

Mr. Palmer's roseate presentation of the home industry, and its future cost of production, the cheapest the world has ever seen, is always to be kept in mind. When anyone contemplates an investment in the Philippines his first impulse will be to read the testimony submitted here in Washington by those who should know what they are talking about, and, if my judgment is worth anything, he will be so utterly bewildered and disgusted that he will abandon his idea immediately, or if he reads enough he will find and Mr. Palmer's prophecy as to the home industry, and the prospect of that battle royal with the educated scientific American farmer against the listless workers of the Tropics will decide the matter for him. Does anyone believe that capital is going to rush into the Philippines any faster than it rushed into other sugar-producing countries, and in face of the possible competition of the American beet industry making sugar at 2 cents a pound? Gentlemen, Mr. Palmer has fully answered himself and his attacks on this bill, and any fair-minded party can see the absurdity of his contentions against the islands. In this case his Philippine producers are best treated by the application of the homeopathic remedy. "Similia similibus curantur" like cures like or a piece of the hair of the dog that bit you, and the ailment melts away. With beet sugar at 2 cents, it means that the good Lord would have to repeat the old miracle of sending down sugar, instead of manna, each morning for the Filipino to collect and ship to this market, and after he has given up .60 freight, .03 insurance, $1 to the refiner, and 49 cents freight to the Missouri River, it looks as though he would have to get another special dispensation from the Almighty to secure the 20 odd cents to bring to the storage and commission houses.

The operation of the land law, which prohibits the creation of any large holding and manufacturing enterprise, is also an obstacle to the successful development of the central factory system. The factory could get a good start, and might never come into conflict with the provisions of the law, but the chances are that after a few years have elapsed it would become necessary to take over the lands of delinquent planters or to acquire their own acreage. It works out in practice that where a central factory commences operations with only the necessary acreage for the mill and yard site, in a few years it absorbs the surrounding properties, either by foreclosure or purchase. This is especially true where a competing factory is in the same territory, for then after the original contracts with the farmers have lapsed the factories are at their mercy, as exemplified in Cuba, and the only method to assure a supply of raw material at a reasonable price is for the factory to plant or control its own acreage.

These are apparently small points, but they assume great importance in estimating the future of such an enterprise, and unless the adverse eventualities are reduced to a minimum no capitalist will risk his money in it.

Now, the fear of the opposition in regard to the future of the Philippine sugar industry as an outcome of this bill is not based so much on the possible tonnage or acreage as on the future cost of production, for it is clear that, granting there are lands sufficient in the islands to produce all the sugar consumed in this country, what possible menace could occur, unless the cost of production was lower than that in the United States or other countries, or so low as to undersell the home product? That is the point at issue, and the opposition has repeatedly shied at it and confined their arguments and testimony toward accentuating the great possibilities of the acreage, which is really a secondary consideration. I have never given this argument serious thought, nor would any other practical man desirous of being fair and impartial, for as to the available acreage, it has been amply brought out by Mr. Wellborn that there are sufficient alluvial lands in the State of Louisiana to supply the country with sugar, and the same statement has been made by Mr. Wagner in regard to the lands of Wisconsin, and it is also true of other parts of our country, and the contention is therefore one having no direct bearing on the case, and only advanced by the opposition to befog the issue and create erroneous conclusions.

The yield of the lands in cane is also another phase of the question having an important bearing on the final merits of the case, and the length of time required to secure a crop, and in making comparisons for the purpose of defeating the bill they should be fair and just, taking all conditions under consideration, and not jumping to extremes, as has been the case.

All we ask is that when making comparisons they remain fair, and not take the most favorable conditions of all the countries in the world and attribute them to the Philippines, and if they will do that we will rest our case in confidence before any body of impartial men. Now, as I have pointed out before the Ways and Means Committee, the comparison with Hawaii reveals a determined attempt to disregard normal conditions, and place our case in parallel with the abnormal, and without the benefit of the qualifying conditions. It is an acknowledged fact that some lands in the Hawaiian Islands secure the phenomenal yields of 10 to 12 tons of sugar per acre, while other lands in the same islands cultivated under normal conditions without irrigation, yield the world's average of 2 tons to the acre, yet to strengthen a certain line of argument detrimental to the Philippines the exaggerated yield of 12 tons is taken as the fair basis of comparison. I hold this is not only unfair, but unjust, and such tactics unworthy of broad-minded people.

It is also a fact that the sugar lands of the island of Oahu and other points producing large yields necessitate a proportionate increase in the cost of production, and it is also a fact that lands in the Hilo district of the island of Hawaii, producing cane under natural conditions without irrigation and averaging 25 tons to the acre, are just as profitable as the lands with the exaggerated crops, and the proportionate cost of production must be the same.

Any great increase or abnormal yield of cane on ordinary lands forcing the growth and richness must necessarily operate under the natural law of diminishing returns. The point is soon reached where the results secured are not commensurate with the outlay of cost. It has been amply proven in Hawaii that under natural conditions of soil and rainfall an acre of tropical land will yield the world's average of 20 tons of cane or 2 tons of sugar. I wish to incorporate in this testimony right here the official figures relating to the Hawaiian crops, as given by the planters' association there, for the last two years, which bear out my statement.

Yields by islands.

Year.	Acres.	Sugar. *Tons.*	Yield per acre. *Pounds.*
OAHU.			
1904	15,832.00	102,019.78	12,888
1905	18,782.84	123,094 76	13,107
KAUAI.			
1904	14,959.15	64,603 47	8,637
1905	16,541.82	76,313 42	9,227
MAUI.			
1904	13,948.80	77,926 00	11,173
1905	15,116.46	100,433.57	13,288
HAWAII.			
1904	47,057.67	122,855.54	5 281
1905	45,002.39	127,523.73	5,667

Yields of sugar for the Territory of Hawaii, crops of 1904 and 1905.

Year.	Acres.	Sugar. *Tons.*	Yield per acre. *Pounds.*
TOTAL YIELDS.			
1904	91,797.66	367,405.07	8,005
1905	95,413.51	427,365.68	8,955
IRRIGATED PLANTATIONS.			
1904	42 809 99	239,987.91	11,212
1905	48,668.12	295,797.99	12,156
UNIRRIGATED PLANTATIONS.			
1904	48,987.67	127,417.16	5,202
1905	46,775.39	131,567.69	5,625

The total tonnage shown in this statement is a little at variance with the figures printed in the crop returns, but this variance is accounted for by the fact that the plantations in reporting their tonnage to the Experiment Station, return the total amount produced for the crop, while in reporting to the secretary of the association they return the amount produced for the year ending September 30, 1905.

This gives the yield by islands. The average yield of all the islands was 4 tons to the acre. The average yield on irrigated plantations was 6 tons to the acre, and the average yield on unirrigated plantations under natural conditions was a little over 2 tons to the acre.

Any increase in yields over the normal must be obtained through increased expenditures. The ground may be plowed deeper, but every inch of depth represents that much additional time, energy, and capital expended, more horses, mules, or oxen are necessary for the power equivalent, and different and larger plows for the mechanical end. On the island of Hawaii, with their ordinary yields, the plowing is performed by mules. If we want the maximum depth of say 15 inches in plowing, we must eliminate the animal power and turn our capital into powerful steam plows. It is apparent an increased yield will result, but at the increased cost. This is what is done in the other islands of the group. If we further add the expense of fertilizing, and irrigate the lands, the results are again increased, and if, as is the case in many of the large plantations in Hawaii, immense pumping plants have to be installed to lift the water from deep wells and deliver it to high elevations against enormous heads the costs increase by leaps, and the point soon reached where further outlay is not justified by the returns, and as they are increased beyond this point the returns diminish. This is exactly what has occurred in the Hawaiian Islands, where the system has been forced on the planters, owing to the limited area of the lands, which forces them to creep up the mountain side, as there are no available lands in the valleys.

Now I am going to incorporate again right here the report of the manager of Ewa plantation, proving that I am right in the assertion that it costs as much in proportion to secure these phenomenal returns as it does to secure the same returns from an estate operating under normal conditions.

On page 1340 of this monograph on sugar, published by the Treasury Department, it gives in Mr. Saylor's report of the Hawaiian sugar industry, the report of the Ewa plantation. I will just read it:

Expenses per ton of sugar grown and per acre

	Per ton.	Per acre.
Clearing	$ 0 51	$ 5.51
Mule and steam plowing	1 41	14.50
Ditches	.20	2 05
Cutting and hauling seed	.80	8 22
Preparing and planting	.88	9 04
Fertilizing	4.01	41 13
Watering	3 63	37.18
Hoeing and weeding	.76	7.85
Stripping	1 49	15 25
Cutting and hauling cane	3 41	35.62
Pumping expenses	2.42	22.84
Sundry accounts, rent, interest, and all other expenses	5.33	51.63
Manufacture	2 65	27.15
Containers	.99	9.77
Total cost	28.59	292.74

That $28.59 was in 1897, when they had contract coolie labor.

I might state that the present costs of the Ewa plantation are $38 per ton at the mill, and the additional selling costs, interests, etc., bring the total up to $50, and the average costs of the islands are somewhere between $45 and $50, or 2¼ to 2½ cents per pound. The testimony of Mr. Hatch, representing the islands, states that notwithstanding these immense yields the average returns on the aggregate capitalization are from 2¾ to 3 per cent. A good many places paid nothing, others as high as 12 to 18 per cent, and where previous to annexation the industry was profitable, the increase of wages, etc., since has greatly increased the costs and reduced the profits.

It will be seen that, although the lands return such a great tonnage, the cost of producing the ton of sugar is approximately the same as the world's average of $40; and, furthermore, despite the apparent phenomenal showing made in the average yield of the islands of 4 tons to the acre, owing to the cane being in the ground for eighteen months, it is really the same as the world's average crop of 2½ tons grown in other tropical countries every twelve months. So on analysis it is seen that the islands do not escape from the equalizing laws of nature, and when we apply the comparison to the Philippines it does not hold water, for it is folly to assume that this system will be employed there, where the land area is ample, and where, under ordinary natural conditions, the lands will produce the same profits to the planter as the forced, highly cultivated, and expensive lands and hillsides of Hawaii. This is simply common sense.

The limit of abnormal development has been reached in Hawaii, and the law of diminishing returns is now in operation. The situation is at present occupying the constant study of the planters' association, through high-salaried soil experts, to devise means to lower the cost, and the last annual meeting of the association was given up almost wholly to a discussion of this topic, as being the most important confronting the life of the industry.

Now, gentlemen, I think that with this elucidation of the subject I have conclusively established the point that as far as the Philippines are concerned we can eliminate from our minds the possibility of ever producing any phenomenal yields like Hawaii, and we are now free to get down to a more rational basis and take a practical, fair minded view of our possibilities.

Now, the point under consideration is the possible cost of production under a reduction of the tariff as embodied in this bill, and whether it will prove a menace to the home industries and drive them out of business. I have come here to-day to be fair and impartial and meet the opposition on their own grounds, and admit many of their contentions solely for the sake of argument, and show them they are in error. Right here I will admit, for the sake of the argument, that the Philippines may under given conditions produce the same yields as Hawaii, and operate up-to-date factories. Now that fairly meets them on their own ground of exaggeration in this instance, with perhaps the difference in wages that exist at present. Now the Hawaiian Islands were annexed in 1898, and came under the operation of our exclusion, contract labor, and immigration laws. Previous to that they employed cheap contract coolie labor, paying about the same as is paid in the Philippines to-day. Now if you will look over the estimate of cost submitted by Mr. Renton of the Ewa plantation to Mr. Saylor, you will see that it bears the date of 1897, and that the cost per ton was $28.59, or approximately 0.015 cent per pounds.

Now in these comparisons, I expect reciprocity, and when we admit the predictions of the opposition as to the islands, we must also admit their own predictions concerning their own industry, and we find that the final report of the Senate Industrial Commission in 1900 fixed the cost of beet sugar at 3 cents. Mr. Saylor states that they were making it at 3 cents in 1900, and other witnesses have admitted the cost at 3½, while Mr. Palmer holds that the future has a 2-cent golden lining to it.

If we are to be compared to Hawaii (and that is the most exaggerated yield per acre that the opposition has taken), and we find that under similar conditions of manufacture, labor, intensive cultivation, and phenomenal yields that we are going to make sugar at 1½ cents, the same as the Ewa before annexation, we have the following costs laid down at the competing district of the Missouri River: Cost at Iloilo, 1.50; freight to New York, 0.30, insurance, 0.0225; duty, 0.42, storage, lighterage, etc. (⅛ cent). 0.125; shrinkage, 2 per cent, 0.03; commission on sales, 2 per cent on 3.50, 0.07; difference between refined and raw, as maintained by the refiners, 1.00; freight from New York to Chicago, 0.24 cents, and from Chicago to Omaha, 25 cents (see Mr. Palmer's testimony on page 593), or 0.49 cents to Missouri River, or a total of 3.9575.

I will make a reduction from $3.95; take off 20 cents and that brings it down to $3.75, before it comes into competition with the refined product of the West, which is now produced at 3½ to 4, next year, according to Mr. Collins, will be reduced to 3, and by the time the Philippines reach any stage of development Mr. Palmer's prophecy will be fulfilled, and the Philippine sugars will never reach there, or by that time the same increase of costs will have prevailed in the islands as have in Hawaii, and the cost at Iloilo will have ascended to the Hawaiian average of 45.00 to 50.00, increasing the cost at the Missouri River to such an extent that competition will be out of the question.

I have only made that comparison with Hawaii to offset the comparison that the beet-sugar people have brought up here about our possible yield, and to show that even under such enormous yields the cost of production would be the same; that we could not lay it down at the Missouri River for less than $3.90. In all this controversy the opposition have deliberately disregarded and ignored well-known facts and conditions, and not content with distorting the facts in comparing the future yield of the Philippines with the excessive product of Hawaiian lands, they further advance the argument and state in effect that the Philippine lands are so fertile that they outrival those of Cuba, and in addition to giving 12 tons of sugar to the acre, they will rattoon for fifteen to twenty years without replanting. They compare us with

Hawaii because that country holds the world's record for yields, and they compare us with Cuba because that island holds the world's record for rattoon crops, and then with Java because that island holds the record for low wages; but they forget to qualify other conditions in these countries which equalizes the differences and in the end places them all on a common basis; for in Hawaii, with the banner yield and the lands forced to the limit of modern cultivation, they can only secure two rattoon crops, and these every eighteen months; and Cuba, where the cane grows like a weed for fifteen years, decreases the yield in proportion, and new virgin lands giving 4 tons to the acre dwindle down to about 1½ tons in the course of a few years; and in Java, where the yield is constant at 4 tons, it is because they plant every year. So it would appear on accepting their side of the argument that the Philippines are destined to produce 120 tons to the acre for fifteen years without replanting and at a labor cost of 10 cents. Of course, they are correct on their final deduction that the cost will be so low that we can place 96° sugars on the New York market for a cent a pound, but, gentlemen, this is the limit of exaggeration, and man's unfairness can go no further.

Mr. Hathaway, who spent some time in the islands securing data to defeat this bill, points out that the cane rattoons for many years, but I pointed out in the hearings before the Ways and Means Committee, from my experience as a cane-sugar engineer, that under the system of cultivation practiced in the islands it is absolutely impossible to secure such rattoon crops, on account of the distance between rows and seed being too small to allow of the development and nourishment of the roots, and I still maintain that my explanation is correct, and until the native changes his methods a successful rattoon crop is impossible; and this will always be impossible for the present planters, as they have not the land area sufficient to double the distance between the rows and secure a yield in proportion to the additional costs involved in plowing, cultivating, etc. I am unwilling to go on record as stating that the islands can ever produce any more than two profitable rattoon crops, which is now secured in some new lands removed from the coast, but under present conditions the high costs of transportation overshadow any benefits accruing to the planter from such crops, but I am not narrow, nor do I wish to cling tenaciously to my view of the case, but am willing, for the sake of argument, to meet the opposition half way and allow that we might in the future secure four such crops, and for the same sake of argument I am willing to allow a slight increase in the tonnage for the first year, but in being fair I will not accept any exaggerated figures, and if we assume several rattoon crops we must also change our comparison and leave Hawaii out of the question and look for a similar field, working under analogous conditions, as to yields and labor wages, and ascertain the equivalent costs of production on which this entire question depends. Not the present cost, but the cost under a modern system of manufacture and transportation, and with a scale of wages equivalent to what now obtains.

I have fairly challenged the opposition to produce for the benefit of this committee a detailed statement of cost of production which will bring the Philippine product down to less than one cent, and they have had ample time to do so. But they have refused to accept a fair challenge, and instead confine their replies to generalities, suppositions, guesswork, and broad unqualified statements that they are unable to prove or substantiate with reasonable data. What we want here are facts.

In the Ways and Means Committee I tried in a brief manner to make clear what the future cost of production would be in the islands under modern methods, and compared the cost with Java to show that there could never be any menace to the home industry, but as Java produces no rattoon crops, and as I have for the sole sake of argument admitted that the islands might, under certain conditions, produce four, I must take for my comparison a country laboring under the same conditions. I would take Cuba, but the comparison would be too strained, as that country stands in a class by itself as regards rattoons, so I can fairly turn to Porto Rico. This comparison is a good one, as the island is small in area, like the average one in the Philippine Archipelago, with the same general geological characteristics, mountainous in the center, and only suitable for cane culture in the accessible valleys running to the coast; no railways, no ports where steamers can dock; the same type of labor, lazy, shiftless, and anæmic; the same low scale of wages, and for the sake of the argument the same fertility of soil, surcharged with clay. Now, what do we find is the case in Porto Rico under these conditions? I am not going to inflict my private views in regard to this, but will quote from the report of Mr. Charles F. Saylor, a special agent and expert of the United States Department of Agriculture, who visited the islands in 1898 to study the situation.

Now, we find in Mr. Saylor's report, by following these comparisons, that they are exactly the same as obtain in the Philippine Islands, even as to the type of labor, their wages, their food, the yield per acre, and the machinery that would be employed under modern methods of manufacture. You will see what the result will be. I will read only short extracts that bear on these particular points. Speaking of the food rations he says:

In this connection it may be worth while to mention the food rations of the people, as it has a bearing on their industries. The results to be attained by labor, whether animal or human, can be largely estimated from the food consumed. It would be as unreasonable to expect good results from either on limited, poor, and sometimes innutritious food as to expect a maximum of energy from a steam engine supplied with a poor kind of fuel.

I investigated the wage scale of the sugar, tobacco, and coffee industries, and these are the chief ones of the island These industries are much alike in their labor requirements. A great many boys from 10 to 15 years of age are employed. They get from 15 to 30 cents a day Spanish money, or from 9 to 18 cents American money. The unskilled adult laborer receives from 35 to 63 cents, or an average over the island of 50 cents a day Spanish money. This equals 30 cents American money. Bosses of gangs in the factory or in the fields get $1 Spanish money. Bricklayers, carpenters, plumbers, and other skilled workmen get the same. Of course, in the factories there are required a few skilled men, such as "boilers," who get $50 per month (gold).

Exactly the same as the Philippine Islands; the comparison could not be better. Then he goes on to say that he only found two modern factories in the island of Porto Rico, one of them the Central de Canovanas, which belonged to the Colonial Sugar Company, an English company, which is operated in the most thorough, up-to-date manner, and where they keep complete records and data about the yield of cane, the extraction, and the effectiveness of the processes employed. In regard to the cane on this place, he says:

I found that the number of crops cut from one planting ranges from one to eleven, that being the highest reported. In a majority of cases the number of cuttings from one planting is three or four.

Now that is the limit that I have assumed that may come in the Philippines, taking the opposition at their word.

Then he goes on to say what the cost of cultivation would be under this system with a labor wage of from 25 to 30 cents a day, the same as pertains in the Philippines and the same class of labor. Mr. Finlay, who also operated one of those up-to-date factories, estimates the cost of growing a crop of cane as follows: First crop, $60 Spanish money per acre; the second cutting (the first rattoon), $20 Spanish; the second and third rattoons, each $20 Spanish. This would be four crops from one planting, and the average cost would be $30 Spanish or $18 United States money. The cost of a rattoon is simply that of hoeing, weeding, keeping the ditches open, doing the thrashing, etc. From Mr. Finlay's books I found the actual cost as charged to be for producing 748½ acres of cane, $20,769.93, an average per acre of $27.75 Spanish, or $16.65 United States money. Embraced in this average is the expense of first, second, third, and fourth crops. The books further showed that it cost about $30 Spanish to harvest and deliver to the factory 1,000 quintals of cane. This would be at the rate of $6 Spanish per ton.

Exactly the same as we are contending for the Philippine Islands. There is absolutely no difference.

According to the best information gleaned from the best cane growers, the first crop on the best land yields from 35 to 40 tons per acre, on an average. On the best cane ground the first crop with the three rattoons would produce an average of from 15 to 20 tons.

Mr. Marr, the manager of the Canovanas factory, says that the first crop on good ground should be 40 tons per acre, with the rattoons ranging from 20 to 25 tons, but he says there is much land there that is tired out, from which may be expected such yields as the following (just the same as those tired out lands in Negros): First crop, from 20 to 22 tons; first rattoon, from 15 to 16 tons; second rattoon, from 10 to 12 tons. The average of the rattoons is about 16 tons per cutting. Mr. Finlay makes the following estimate: Good ground, first crop, 40 to 45; first rattoon, 20 to 25; second rattoon, 20 to 25 tons per acre; second-class ground, first crop, 40 tons, and rattoons, considered inferior, ranging from 12 to 15 tons. The same gentleman says that the best varieties are Salangore and Olaheiti.

Mr. Marr states that they extracted in sugar a small fraction above 10 per cent of the weight of the cane worked. Mr. Finlay says their sugar last year equaled 9.4 per cent of the weight of the cane, and for the two years preceding last year, 8.7 and 9.25, respectively.

HON. GEORGE I. FINLAY'S ESTIMATE OF THE COST OF MAKING SUGAR.

Mr. Finlay says that it will cost him 15 cents per hundredweight, United States money, to transport his sugar from the mill and place it aboard ship. The mill is 3 miles from the railroad and the station is about 16 miles from the seaport. It costs him 15 cents per hundredweight to ship his sugar from the seaport to New York. If shipped in bags it costs 2 cents more than if shipped in hogsheads. It costs him $1.74, United States money, to produce a hundredweight of sugar, including cost of cane. He figures the expense for delivering the cane to the mill at 2.72 cents per hundredweight of sugar in gold. This would make a hundredweight of sugar cost him at New York $2 0672, exclusive of import duty.

The statement of cost of manufacture is as follows:

Cost of Spanish money of making a hundred pounds of sugar.

Labor in works....	$0.1772	General miscellaneous expenses, salaries, etc , not including interest on investment..	$0.4415
Fuel................	.0870	Expenses on manufactured sugar, such as weighing, delivering to port, etc..........	.1533
Bags................	.1006		
Repairs............	.1600		
Repairing railroad	.0366		
Repairing work, carts, etc.........	.0922		
Care of 700 head of cattle.............	.0818		
Taxes on mill and farm..............	.0110		
		Total..........	1.4402

The total cost of making 1 ton of sugar, at the rate of $1.44 per hundredweight, is $31.68 Spanish. This, in United States money, would be $19. The cost of producing a crop of cane is estimated to be $1.45 Spanish per hundredweight of sugar, which would be $31.90 Spanish per ton of sugar, or $19.14 in United States money.

The cost of harvesting is put at $30 per thousand quintals (100,000 pounds, or 50 tons) of cane, or 60 cents per ton. Estimating the amount of cane necessary to make a ton of sugar as 10 tons, the item of harvesting and delivering is 60 cents multiplied by 10, or $6 Spanish, which equals $3.60 United States money.

Bringing together the cost of these various operations in their natural order, we have the following:

Cost of producing cane for 1 ton of sugar	$31.90
Cost of harvesting cane for 1 ton of sugar	6.00
Factory cost of producing 1 ton of sugar	31.68
Total cost of production, per ton, in Spanish money	69.58
Total cost of same, reduced to United States money	41.75

As the ton here used contains 2,204 pounds, the cost per hundredweight is $3.16 Spanish, or $1.89 United States money.

The following shows the daily wages paid in the Carolina factory: Boys from 15 to 30 cents Spanish, or 9 to 18 cents United States money. Men from 35 to 75 cents Spanish, or 21 to 45 cents United States money. Bosses about $1 Spanish, or 67 cents United States money. The average wages per day for men is about 50 cents Spanish, or 30 cents United States money.

Mr. Marr's statement follows. The estimates were taken from the books of the Canovanas factory.

MR. W. S. MARR'S ESTIMATE OF THE COST OF MAKING SUGAR.

In making up this table I have used the ton of 2,204 pounds and reduced all values to United States money.

The actual factory cost of making a ton of sugar, as shown by the books for a series of years, is $16.

Cost of cane	$19.20
Cost of manufacture	16.00
Cost of placing on shipboard	.96
	$6.16

The difference of over $5 per ton between the cost of production at the Canovanas factory and at the Carolina factory results largely from the difference in the amount of sugar secured from the cane, a difference in favor of the former factory equal to about 1 per cent of the weight of the cane, or 220 pounds per ten tons of cane (the amount required to produce a ton of sugar at the Canovanas factory). This difference in product at $35.20 per ton, its actual cost at the Canovanas factory, is worth $3.52.

I wish to state that while it is my privilege to examine into the works of a great many sugar factories, in statements touching the sugar industry of Porto Rico, I have referred more particularly to Mr. W. S. Marr and Hon. George I. Finlay for two reasons: First, these managers have complete data covering all the workings of their establishments, which are equipped in such a way as to show up the resources of the sugar industry of the island when working under its best condition; second, through the courtesy of these gentlemen, I was allowed to gather from their books and experience every item of information desired, so that the statements given concerning them and their works are based on the actual facts.

Now, not to dilate too much, I will come right down to the cost of production. As Mr. Finlay says: "Bringing together the cost of these various operations in their natural order, we have the following: Cost of producing cane for 1 ton of sugar, $31.90; cost of harvesting cane for 1 ton of sugar, $6; factory cost of producing 1 ton of sugar, $31.68; total cost of production per ton, in Spanish money, $69.58; total cost of same, reduced to United States money, $41.75"—or over 2 cents a pound.

Then Mr. Marr's estimate of making sugar—Mr. Marr, of the Canovanas factory, the best factory at that time in Porto Rico. His estimate for cost of cane was $19.20; cost of manufacture, $16, and cost of placing on shipboard, 96 cents, which brings it up to $36.16—a difference of over $5 per ton between the cost of production at the Canovanas factory and at the Carolina factory, resulting largely from the difference in the amount of sugar secured from the cane, a difference in favor of the former factory equal to about 1 per cent of the weight of cane, or 220 pounds per 10 tons of cane (the amount required to produce a ton of sugar at the Canovanas factory). This difference in product at $35.20 per ton, its actual cost at the Canovanas factory, is worth $3.52.

That point is clearly brought out by a disinterested official investigator who went over the books of those companies, at 2 cents a pound.

Now, gentlemen, I have shown what the future cost of sugar will be, as compared with the phenomenal yields of Hawaii and two rattoon crops and coolie contract labor, and the cost, as compared with Porto Rico, with four rattoon crops and the world's average yields of 2 tons, and with labor on the same wage scale as the coolie, but inferior in efficiency. We have already proven that the Hawaiian system of cultivation is peculiar to itself, enforced on the planters by purely local conditions, and that they could not apply to the Philippines, so that for our purpose the comparison with Porto Rico is more to the point as reuniting all the same general characteristics as obtain in the Philippines in the future, but I am willing to go further and stretch this line of argument to cover other localities, and we will find that the same solution and general result is bound to occur. In the hearings before the Ways and Means Committee I made a special point, in comparing the future with Java, to show what the possible cost might be, but only in a rudimentary manner, as I thought the point made would be convincing.

I want to refer the committee to my statement before the Ways and Means Committee, where I pointed out that the cost of producing sugar in Java, with the lowest possible labor wage in the world of 10 cents a day, under modern methods of manufacture, is $1.40 per hundred, or $28 a ton. I will come to that later on. That point I made before the Ways and Means Committee, and dilated on it a little.

The point has since been advanced by the opposition that what Java could do in developing and increasing her crop the Philippines could also do, basing the assumption on a mistaken idea of the relative density of population and the methods employed in forcing the growth of the industry. As a matter of fact, the island of Java has a population of 28,000,000—a small island about the same as Luzon—against a population of 8,000,000 for the whole of the Philippine Islands; and whereas the labor wage in the island of Java might naturally expect to go down on account of their great population the labor wage in the Philippines is bound to increase. As a matter of fact, the "culture" system under which the Java industry has forged ahead was due to the Netherlands Government, which advanced the necessary capital for the erection of the factories and guaranteed to the manufacturers that the natives in the district would supply enough cane to make the enterprise a success, and forcing the native to give a certain proportion of his time to work in the fields. In return, the manufacturers contracted with the Government to sell it a third part of the sugars at a fixed price to repay the loan. This system proved so profitable as a revenue earner that it netted the Government an average income of over $3,000,000 a year for some time. The above conditions have been somewhat modified, and at present the natives supply some 80 per cent of the cane direct to the mill, without the intervention of the Government guaranty. The point in regard to the Java industry which must be borne in mind is the high average yield of the lands of something like 4 tons to the acre, which is 2 tons higher than the world's average.

Now, this requires explanation. The available lands for cane cultivation are restricted in area, and great estates are impossible, nearly all the native holdings being very small. If the lands were allowed to rattoon, there would be a big decrease in the crop and earning capacity of the farms, so that with cheap labor, the cheapest in the world to-day, it is more profitable to replant every year and secure the maximum yield than to allow the cane to rattoon and secure a diminution of one-third to one-half in the cane tonnage. That explains the reason why the yield in Java is maintained from year to year at its high average, and also explains why in no other place in the world can the same system be employed, except in a country with a high protected tariff. I might also add that the rotation of crops is compulsory in Java, and the lands, in addition to this rest, are carefully spaded, and the crops cultivated with the same care as the Chinese give their truck-garden patches. In other words, with the cheap labor the crops are nursed with great care.

It is undisputed that the cost of producing sugar in Java under all these favorable conditions is something like $28 per ton, or $1.40 per hundred, the same as it was in Hawaii, with higher yields and a similar class of labor.

In comparing this with possible Philippine development, and granting, for the sake of argument, the same high yield of 4 tons, and the same wage rate of 10 cents per day, the future cost laid down at the Missouri River will be as follows:

Cost at Iloilo	$1.40
Freight	.30
Insurance	.04
Duty	.42
Storage (¼)	.125
Shrinkage (2 per cent)	.028
Commission	.06
Difference	1.00
Freight to Missouri River	.49
Total	3.863

Or $3.96 at Denver.

At the lowest possible cost of production in the world to-day, with a labor wage of 10 cents per day and a yield of 4 tons of sugar to the acre, the cost, laid down at the Missouri River, would be $3.86.

So, granted this abnormally low estimate of comparison, we are still out of the race, but, as a matter of fact, our wage rate is now three times that of Java, or 30 cents per day, and our yields, even with modern methods, about half, so that in reality the cost of our sugars laid down at the competing district of the Missouri River would be over 4½ cents, and when we raise the wage rate, as is sure to happen under American stimulus, and then raise the freight rate, which is as sure as fate when the coastwise shipping law goes into effect, it will be seen that our sugars stand no chance at all, and with Mr. Palmer's prophecy staring us in the face of a beet cost of 2 cents, the above is only an idle dream, and it would seem that instead everything indicates that beet sugar will be imported into the Philippines within the next ten years.

It is absurd to think that the United States will ever foster and encourage the cane-sugar industry in the Philippines on the same basis as the Netherlands Government did in Java, and so promote a rapid development. On the contrary, the exact reverse is the case, for instead of forcing the native to work it is encouraging him to go to school, and one of our first acts was to free the laborer from the old Spanish law which compelled him to work out his money advances from the planters. At the present time the planter still continues to make the necessary advances to lure the native from his home, and after receiving the money in hand the latter works it out, or not, as it suits his royal convenience, and, as he is a free man, there is no law to compel him to live up to his bargain. So it can be readily seen that any rapid development of the sugar industry in the Philippines, as compared with Java, is not warranted by any careful consideration of facts.

Now, let us take a brief glance at the costs of producing cane sugar in other tropical countries with analogous conditions and see how they compare. I am going to ask you to come over and look into the industry in the British West Indies, where every condition is similar. You will remember that the industry in these islands has been in a precarious condition for many years, and the planters have, in many cases, been ruined, and that the situation was so grave, threatening the very economic life of the colonies, that in response to their appeals the British

Government in 1898 sent over a royal commission to study and make a report on the situation. Every island of the Crown was visited and complete hearings given the planters, testimony being taken and recorded, and in every instance the cost of manufacturing sugar was made the basic study. These hearings and report fill three large volumes and exhaustively cover every point. Now, what do we find is the average cost of production in these islands as developed by sworn witnesses?

In British Guiana, with an average yield in sugar of 1.7 tons to the acre and coolie labor, working with modern apparatus, the average cost per ton in the colony was found to be $47.50. The planters were dependent upon their labor supply from India, the government bringing in the coolies and contracting them for a term of years at a low rate of wage, and yet only those estates having the best soils and a succession of good seasons have survived. In Barbados, with a population of over 1,300 to the square mile, the home of cheap labor in the West Indies, and working with the old wasteful methods of the muscovado system, securing low-grade sugars the same as the Philippines with a labor cost of not exceeding 20 cents per day, the cost was brought out as $43 per ton. In the island of Trinidad, with an average yield of 1.2 tons of sugar to the acre and employing coolie contract labor, the cost wast $50 per ton, and resulted in closing down and ruining all those estates not equipped with modern machinery. In the island of Tobago the cost of producing a hogshead of muscovado sugar weighing 2,000 pounds was $35, or equivalent to $40 per ton, on a wage rate of 16 to 20 cents per day. In St. Lucia the cost in the central factories existing there was given as $50 per ton. In St. Kitts-Nevis the average cost was found to be $47.50 for muscovadoes, and in Jamaica for the same grades it was $36.50.

Gentlemen, these figures speak for themselves. In all these islands cited the planters enjoyed the cheapest kind of labor, not exceeding 20 cents per day, lands averaging 1½ tons to the acre of low-grade sugars, working with the most primitive outfits—in other words, an exact duplication of existing conditions in the Philippines—and we find the average cost something like $40 per ton, or 2 cents per pound, and they all went "broke." The same conditions as to average yields, average scale of wages, and average costs of ₱4 per picul, or 1½ cents per pound, or 2 cents with all charges added, obtain in the Philippines to-day, and for the same identical reasons the Filipino planter is reaching out his hand to you to save him from being wiped out. Gentlemen, when the facts were presented to her, and her statesmen grasped the full significance of the situation, Great Britain brought about the Brussels convention, Great Britain gave her colonies a square deal, and to-day with the same conditions prevailing in the Philippines, with ruin and foreclosure staring them in the face, the Filipino planter and the Americans of the islands turn to their Congress and appeal to them for the same justice, the same fairness, the same square deal that Britain conceded to her people in the hour of need.

Let me return to my comparisons. We have compared the islands with Hawaii with its high yields and coolie labor, with Porto Rico on ordinary yields and the equivalent to coolie labor, with Java and coolie labor and fair yields, and I have just shown you that with the same analogous conditions in the British West Indies as exist at present in the Philippines the sugar industry was ruined, and had to be aided by government intervention, but I am not through yet with my comparisons, as reference has been repeatedly made to Cuba, and citing that island as a criterion for the future of the Philippine industry.

Now, what do we find are the average conditions existing in Cuba to-day? We find modern mills equipped with the best machinery, fields averaging 2 tons of sugar to the acre, and rattooning for as high as fifteen years, and a labor cost of anywhere from 75 cents to $1 per day. What is the average cost of production under this system? I might answer it offhand from my own experience, having lived there for thirteen years, but my opinion might be called biased, so we will turn to the hearings on the Cuban reciprocity bill before the Ways and Means Committee in 1902 where the point was carefully brought out and dilated on by men who knew what they were talking about.

Mr. Edward Atkins, of Boston, owner of the Soledad Central, near Cienfuegos, testified that the cost was 2⅛ cents; Mr. Hugh Kelly, of the Central Teresa Company, at Manzanillo, said it was 2.16; Mr. Miguel Mendoza, of the Central Santa Gertrudis, at Banaguises, said it was 2¼ cents; Mr. Armstrong said that with modern methods it should be 2 cents; Senator Hawley, of Texas, of the Chapparra Sugar Company, said it was about 2 cents; Mr. William Bass, of the Central Consuelo, in Santo Domingo, said that at 3½ cents in New York he was being put out of business. Col. Tasker H. Bliss, collector of customs for the military government of Cuba, submitted six statements covering the cost in different districts, as follows:

Caibarien district, 2 cents; Matanzas district, 0.022; Cienfuegos, 0.025; Cardenas, 0.019; Habana, 0.02, and last an average for the whole island of 0.022 cents. Mr. Machado, of the Central Esperanza, gave the cost at 0.0206; Mr. Joaquin Piedra, of the Feliz Sugar Company, states 0.025, and Mr. George Fowler, of the centrals Dos Hermanos and Parque Alto, testified that it was 0.0239, f. o. b. steamer, at Cienfuegos. Now I may state that from my experience in Cuba these costs are all conservative. So here we have the costs as testified by gentlemen who knew what they were talking about, as they were all manufacturers; but we find that the beet-sugar opponents pursued the same tactics then as they are doing now, by attacking the veracity of the statements and striving to prove that the gentlemen from Cuba were exaggerating their costs, and instead of the 0.0225 average, as testified, the average cost should be taken as 1¼ or the lowest theoretical cost of the island.

It has always been a commonly accepted fact amongst Cuban sugar planters that, given certain conditions, such as new—virgin—lands, deep soils, favorable locations as to rainfall, and situating the mill house alongside the sea, with deep-water shipping facilities, so that steamers can come alongside dock for the cargo, that sugar could be produced in Cuba for about 1¼ cents per pound; but up to the time of the passage of the reciprocity bill there was only one estate in the island which reunited these favorable qualifications, but the losses resulting from the war had put them so far back they could never aspire to that low cost. As a matter of fact, several of the new and mammoth centrals erected since the war have based their calculations along this estimate; but, notwithstanding the accepted fact, other conditions have sprung up which have prevented the desired result, and instead of a cost of 1¼ as hoped for, it has been nearer 1¾ instead. The great saving as between 2 cents and an estimated cost of 1¼ cents lies in the fact of being free from excessive railway charges, which to the ordinary estate located in the interior meant an average increase of over a third of a cent on transporting cane and supplies to the mill and sugar to the shipping port, and the incidental warehouse and lighter rates.

Now, even granting that soil conditions in the Philippines were the same as in Cuba, a possible cost of 1¼ cents based on deep-water shipping facilities are impossible in the islands for there is not a place or deep-water port on any of the sugar islands where a central factory could be erected and have the steamers come up to the dock. The best that could be hoped for under the most favorable conditions is that the sea might remain calm enough for the steamer to anchor some 3 to 5 miles or more off-shore and have the sugars lightered out. This costs money, aside from the risks involved, and in touching on this question I might mention that anyone who contemplates building an immense central factory on any of the islands has a problem confronting him to get the massive machinery ashore and transported to the point of erection. In my opinion, for a long time to come, the sugars of the southern islands will continue to go to Iloilo in light-draft sailing vessels for final deep-water shipment, and there is no escape from it, and is an item of cost which must be considered. When some of the projected railways are built they will diminish the risks, but I am confident the freight rate to the port will be quite as high, if not higher; and if sugar is the chief crop of the district, sugar will pay the freight. It might be reasonably urged that in some localities on the coasts of the southern islands a central factory could be established and build its own wharf out into the sea for a mile for the steamers, and I will admit it for a minute, but only till one of our peculiar typhoons meandered along, after which you could look in vain for the long wharf, and you could go ahead and rebuild it—that is, if you had a $30,000,000 agricultural bank to help you out about twice a year to the extent of $50,000 a whack.

So I think we can safely eliminate from this discussion those centrals in Cuba which theoretically might make sugar for 1¼ cents and confine our comparison to the 90 per cent whose average cost is admitted to be 0.0225 cents.

Now, before we go any further with these comparisons, I want to raise an important point. It has been stated that the labor item represents 90 per cent of the cost of making sugar, which under given conditions such as prevail with old-fashioned methods may be about right, though a little exaggerated, but the minute we take a modern central factory, with all that it implies in the way of skilled and technical help, there is a difference. The salaries of a technical staff—administration, engineers department—are practically the same the world over, and while the field labor may be 90 cents a day in Cuba, 50 cents in Porto Rico, $1 in Louisiana, and 75 cents in Hawaii, the salaries of managers and staff remain about the same, and in the case of the Philippines they would be some 33 per cent higher, owing to the increased inducements and passage money both ways. When to this we add the increased cost of repairs, maintenance, transportation, freight charges, cattle losses, and depreciation and interest charges, incidental to a $500,000 enterprise the actual unskilled labor charge is more like 50 per cent than 90 per cent. The point is that in reality only about 50 per cent of the costs are subject to the fluctuations incidental to rise or fall of the labor market.

If we will take as a fair sample the detailed statement of cost submitted by Mr. Renton to Mr. Saylor, to which we have already referred, and separate the items into those representing all labor and those representing fixed charges, purchases, etc., we will find as follows:

Clearing, all labor	0.74		
Mule and steam plowing, one-half labor	.705	one-half fixed charges	0.705
Ditches, all labor	.20		
Cutting and hauling seed, all labor	.80		
Preparing and planting, all labor	.88		
Fertilizing, one-fourth labor	1.00	three-fourths costs	3.01
Watering, three-fourths labor	2 72	one-fourth	.91
Hoeing and weeding, all labor	.76		
Stripping, all labor	1.49		
Cutting and hauling, three-fourths labor	2 61	maintenance, one-fourth	87
Pumping		fuel and maintenance	2 42
Sundry			5 33
Manufacture, three-fourths labor	1 9875	one-fourth maintenance, etc	6625
Containers			.99
Labor	13.8925		14.8975

So it will be seen by the above analysis of the costs on the Ewa that the actual labor cost is 13.89, or about 48 per cent of the total, against 14.89 for salaries, maintenance, fixed charges, etc. However, to be fair and allow for different conditions, we may take for our purposes that the proportion of cost affected by the variance in wages is, say, 50 per cent, and having determined this point let us compare the Philippines with a wage rate of 30 cents with Cuba on a wage rate of 90 cents:

Average cost in Cuba	0.00225
50 per cent salaries, fixed charges, etc	.01125
50 per cent labor	.01125
One-third less	.00375
	.01500

Here we have the cost as compared with Cuba on a wage rate of 30 cents per day at 1½ cents per pound, granting all the soil conditions the same. Now, if we increase our labor cost to 50 cents per day, which is inevitable, as it approximates that rate to-day, we have evidence presented here by the honorable Secretary of War that Mr. Wheeler, who is operating a lumber company in northern Negros, is now paying 37½ cents, and transporting rice and other comestibles free, so they can be had at Manila prices, it will be seen that at this 50 cent labor wage the cost of producing sugar in the Philippines as compared with Cuba will be 0.017. This again brings the cost laid down at the Missouri River the same as we have already figured out with respect to the comparison with Hawaii, or 3.9575 with labor at 30 cents and 4.16 with labor at 50 cents. And right here I want to state that the efficiency of the Cuban laborer is about twice that of the Filipino, which makes a material difference and would probably affect the initial cost of 1.70 to the extent of raising it to 1.90 or 2.

So, gentlemen, I will again assert that no matter where you turn to for a fair comparison it will be seen that the equalizing laws bring the average down to about the same thing. In Hawaii they were 1¾ cents with coolie labor and 2 cents without; in Porto Rico they were 2 cents with coolie labor, and in Cuba 2¼ cents with labor at 90 cents, 1½ cents with labor at 30 cents, and 1.7 cents with labor at 50 cents.

If we apply the same rule to Java, with a cost of $28 per ton, or, say, 1¼ cents per pound at 10 cents per day, and apply a labor rate of 30 cents, as in the Philippines, we have as follows:

Cost	$0.0125
Salaries, maintenance, etc., 50 per cent	.00625
Wages represent 50 per cent.=.00625, multiplied by 3 to equalize Philippine scale	.01875
Comparative cost at 30 cents	.025

Cost	$ 2.50
Freight	.30
Insurance	.04
Duty	.42
Storage	.125
Shrinkage	.05
Commission	.06
Difference	1.00
Freight to Missouri	.49
	4.985

or again equalizing conditions throughout the world, if cane was planted every year, as in Java. This would make a cost of 4.985 laid down at the Missouri River.

If we now assume the same wage in the Philippines as in Java, or 10 cents per day, and take our possible average of 2 tons of sugar to Java's 4 tons, it will be seen that the producing power of the 1¼ cents cost in Java is double that of the Philippines, so that the cost to raise the 4 tons to the acre in the Philippines, on the same wage rate, would be double, or 2½ cents, or again equalizing conditions throughout the world.

Now, I have clearly demonstrated to the committee that whatever comparisons the oppositions have made, if we take into consideration surrounding conditions and be fair, it will be seen that the Philippines' cost of producing sugar will be between 1½ and 2½ cents, the same as the other cane-sugar countries, and that even under the lowest possible cost of 1¼ cents it stands no show in the future competition with the home beet.

Now, I have finished with that phase of my statement, and have only gone into it at all because I have been forced to take cognizance of their repeated assertions that we could produce sugar cheaper than any other country in the world. We will now get down to the real point.

Now, gentlemen, we have taken the opposition at its own value, and have clearly proven that under any comparison they take it is impossible for Philippine sugar to seriously compete with the home-grown product. But I must call your attention to the fact that I have been comparing our future cost on a basis of a 25 per cent duty, as provided in the bill for three years only, and our opponents might with justice cry out that I was trying to hide the real point that will come with free trade, lowering the cost some 42 points. But I do not intend to shirk it, though in granting this I must again demand certain concessions in our economic conditions that are inevitable.

When we come under absolute free trade we must also come under the operation of our coastwise laws, now held in abeyance. Does not experience teach us, wherever American transportation companies have a complete monopoly, the freight rates are out of sight? Does not the experience of the Hawaiian Islands, whose freight rates to the mainland have doubled since annexation, point out what we may expect under similar conditions in the Philippines? Can we alone expect to be favored in all this great nation and freed from the penalty attached to free trade? What does this imply? It means that average freights, which are now $6 per ton, will increase to $12, or $0.60 per hundred pounds.

When, in the due and logical course of events, the Philippines assume their share of the Federal burden, turning over to the Federal authorities the customs receipts, diminishing to that extent the revenues of the insular government, will not the deficit have to be made up by full internal taxation? Will it not be just, after planters have been given a profitable market, that they resume their share of the general taxation of their lands, which law is now repealed for some years? Will not this and other items have to be added to the cost of production? And then as development is stimulated, as new enterprises call for more efficient labor, will not the labor wage rise steadily toward the unit of the dollar mark? All these are but a repetition of what has occurred in Porto Rico and Hawaii, and the Philippines will prove no exception to the rule. Will not the building of the railroads, the construction of immense public works and improvements, the exploitation of the forests, the opening up of mines, the development of the great hemp monopoly, and other such enterprises call for their quota of labor, and will not the competition stimulate and advance wages? If it does not, gentlemen, it will be directly contrary to all laws of supply and demand. We must accept of what experience teaches and anticipate this natural rise in labor wages. If the normal wage in the cities to-day is $0.50 and $0.30 to $0 37½ in the country, for any large demand, the inevitable result is that in a few years this will advance to $1 in the large centers and 50 to 75 cents in the fields. I say in a few years, but this will occur as soon as a sudden demand is created, as only under a high inducement can the Filipino be persuaded to work, and this to be really successful must include the transportation of his entire family to the labor center, where proper houses have to be ereeted to keep him there. So when we look forward to what the probable cost of sugar will be under free trade, we must in all fairness confront the changed conditions inevitable to such a situation. Of all the comparisons already made, the most equitable, as fitting all our conditions, was the one with Porto Rico, and we can safely estimate on a future average cost of sugar in the islands at 2 cents, or the world's average. Under the changed conditions, add 60 cents freight and insurance, $1 differential, and 49 cents freight to the Missouri River, and the other constants, and we have a total of $4 35, deduct a half a cent if you want, and we are still out in the cold. Under no possible estimate or calculation, based on reasonable data, can the cost be brought down to less than a cent, as the opposition would have it. So here we have looked again into the future from a sound, practical standpoint and we find that they are still in error.

The point has been raised by Mr. Humphreys in his testimony here before this committee that the yearly increase of production in any one of our sugar-producing centers is more than ample to cover the annual increase of consumption, which he places at an average of 63,000 tons for the ten years ending 1905. Mr. Humphreys bases his figures on the estimates of Willett & Gray for the coming crop, which shows a great increase for all countries. When the Cuban reciprocity bill was under consideration and the issue between the refiners and the beet-sugar people, the latter openly challenged the accuracy of Willett & Gray's statistics, and charged them with being under the influence of the trust. I see they have experienced a change of heart, and the authority they then despised they now call on for aid.

But they bring the point up and state in effect that the annual increase in the beet, in the cane-sugar product of Louisiana, of Porto Rico, and Hawaii can, individually, take care of the annual increase of consumption. Let us look into this and analyze the statement.

It is generally conceded and accepted as a fact that the Hawaiian Islands have reached the limit of their production and can never hope to pass 450,000 tons. The limited land area, coupled with the scarcity of labor, absolutely prohibits any further expansion of the industry, and at the present time, aside from the high costs of cultivation, the great problem to be solved is that of labor. It is conceded among the Hawaiian planters that a production of 500,000 tons is possible, but that the extra 100,000 tons would be produced at a loss. I have already explained why it is unprofitable. Hawaii has always had her labor problems, even before annexation, but the situation is now so acute that they are talking of establishing an immigrant station at New York in the hope of inducing Europeans to settle in the islands. They have tried all kinds of cheap labor—Kanakas, South Sea Islanders, Chinese, Japanese, Koreans, Portuguese, and Porto Ricans—but the final judgment is that they must turn to the white man. As our party passed through Honolulu the authorities and sugar men were arranging with some Russian elders to bring in several hundred of their countrymen.

As to Louisiana, the situation there is notorious. They are not only handicapped by having an industry foreign to the soil and climate, but their labor supply has steadily decreased. The negro element—the old mainstay of the plantations—has been enticed away by the higher wages offered by the railroads and other industrial enterprises, so that to-day the Louisiana planter is at a loss for proper and sufficient labor. Like his Hawaiian brother, he is "up against it," and although there are unlimited alluvial lands in the State capable of cultivation the lack of labor to work them is a bar as insurmountable as though they were limited in the actual acreage under cultivation. The Louisiana planters have also turned to foreign immigration as the only means of saving their industry. Immigrant stations have been established at New Orleans to catch the new arrivals from Italy and entice them out to the cane fields,

and they also talk of extending their propaganda and efforts to other ports. Like their Hawaiian confrères, they want cheap labor—the cheaper the better—and they confess that they have had many Filipinos working there with good results. It can be safely accepted as a fact that the lack of labor constitutes a perfect check on the further development of the Louisiana cane-sugar industry, and while the crop may advance a few thousand or more tons, owing to the stimulus of a high market like last year, it will dwindle again to the old output, and decrease rather than increase.

As to Porto Rico, there is considerable discussion as to the capacity of the island. They have the population, but the area is limited. Every available plot of soil is under cultivation in some crop. All the lands can not be put into sugar, and conservative estimates place the limit as between 250,000 and 300,000 tons, and nearly all the available cane acreage is now planted to that crop. (Note Willet's testimony corroborating.)

Now, as to Cuba, it would be folly to attempt to make any statement of the capacity of the lands for cane as a limitation to her output, and here again the line is drawn by the available labor supply. Our friends of the opposition point with glee to the great development of the Cuban industry in the last few years—from 600,000 to over 1,000,000 tons—and attribute the advance to the working of the reciprocity treaty, when, as a matter of fact, it was the natural recovery from the disastrous effects of the insurrection and war. In 1894 and 1895 Cuba produced over 1,000,000 tons, and the rapid increase after peace was declared was due to the return to normal conditions. Last year, which is everywhere admitted as a phenomenal one, encouraged the farmers to increase their acreage, but it is an undisputed fact, widely commented on in the technical journals, that the new plantings were so large that no consideration was given to the extra labor necessary for moving the crop, and, as a fact, the estimated increase of something like 200,000 tons called for the employment of nearly 40,000 extra laborers, and no visible means of securing them. The labor question has occupied the Cuban planters to the exclusion of every other topic. As we enforced on Cuba our immigration laws, it has placed a check on bringing in cheap coolie labor, and the hope of the island, like Hawaii and Louisiana, is in the encouragement of labor from Europe. For Cuba to greatly increase her output means that she will have to adopt the same methods as Hawaii, which is really unprofitable and unlikely, or she will have to greatly increase her immigration.

As to our home beet-sugar industry, the lack of efficient labor is also the most formidable obstacle to any rapid development, as it is conceded that the independent American farmer will not lower himself to carry on the slow, tiresome, menial drudge work necessary to successful beet-sugar cultivation in the field, and wherever beet raising is a success it is because entire families are engaged in field labor, where the mother and daughter and little boys of 10 years perform the same work and are just as valuable as the full-grown man. It is a fact that entire families of Russians are imported into Michigan from Nebraska to cultivate the beet farms, and the man's efficiency is in direct proportion to the size of his family. Mr. Collins, operating a beet-sugar factory in Ohio, in the presence of this committee proudly exhibited the photograph of one American family of fourteen, composed of father, mother, daughters, and various young children who were working in his beet fields. Talk about coolie labor or the peons of Mexico; it is far more honorable, far more becoming to us as a nation to encourage a natural industry in the distant Philippines than to foster and build up an unnatural home industry which degrades the mother and daughter and drags them down to the same level and plane as the peasant women of Europe, who monopolize the work on the farms.

Don't pass this bill, say the beneficent beet-sugar magnates, for by so doing you will enslave the poor benighted little brown Filipino, you will forge the links which chain him to a life of slavery in the tropical cane fields, under the lash of the cruel American oppressor and exploiter, and we protest in the name of humanity against the barbarous measure! Lend us your ears! Extend to us your aid! Come with us to Colorado and, when this fair land is dotted with the hundreds of beet-sugar factories, when the land is blanketted with thousands of beet farms and you are drinking your morning coffee sweetened with the sugar produced at home, you can think of the great good we have accomplished, think of the motherhood of our farming regions released from the drudgery of the washboard and the kitchen and elevated to the higher and nobler mission of thinning out beets on her hands and knees under the summer sun, so that your lives may be sweeter; think of the youth of our farming districts—the thousands of small boys and girls—the future hope and greatness of our country—liberated from the tyranny and the rod of the village schoolmaster and the reformatories, and their young lives enlightened and their physique strengthened by bringing them into direct touch with nature in the glorious beet fields. Think of the great benefits bestowed on our race and how this menial, slow drudgery will develop the children of our rural population into a more hardy, more intelligent type than their rugged, independent American ancestor. Don't let the coolie work in the land where he is at home; let down the bars so he can come to Nebraska. We need him there to keep company with the Russians, Poles, Japanese, Indians, Mexicans, and other so-called American laborers. That is what home grown American beet sugar means.

Our friends of the opposition, who are so worried over the future of the poor Filipino, who express such benevolent and altruistic views for his emancipation, and who see over there in the jungles of those far-away islands millions of future serfs for the cane sugar barons, why don't they put into practice what they preach? If they are in earnest about their salvation, why don't they go over and secure a few thousand to work their beet fields and release our own race from the degrading yoke? There is no law that I know of against the importation of Filipino labor, so the altruistic beet, the enterprising Hawaiian, and Louisiana planter can surely have no objection nor find any difficulty in solving their troubles. They say the labor is there in abundance, despite all that others have said to the contrary. All right, I answer, more power to you, go and get them; you need them in your business. Why don't they try? We have tried. We have tried to induce them to go from one province to another and failed. We have shown those who were starving in Cebu that they could earn $2 gold per day in the hemp fields of Sorsogon; we have offered two months' pay in advance to entice the Tao from his nipa shack in Capiz to the cane fields of Negros; we have sent out men in the provinces of Pangasinan, Isabela, Nueva Ecija, and Pampanga to enlist laborers for the Benguet road, and we have failed to budge him away from his guitar and his vino. But we don't know anything over there. We Americans are not up to the ways of the natives. No, only the American beet-sugar men know what they are talking about; they know better; they can do what we failed to do. Well, there's the islands, there's the labor, and here's the demand. Why don't they try? Mr. Hatch, representing the Hawaiian planters, when asked the question, condescended to honor us who know by stating the Filipino would not leave home. We told him that—he don't know it from his own knowledge. Let him try.

Maybe, gentlemen, the future will show that we exiled Americans in the far-away islands know what we are talking about.

COST IN PHILIPPINES.

Now, what do we find in the facts as to the actual cost of production in the Philippines to-day? Various testimony has been advanced by both sides to make their arguments plausible. The beet-sugar people, through Mr. Hathaway, Mr. Palmer, and others have shown that sugar could be produced at less than a cent a pound and corroborated this statement with data secured on the ground or with testimony presented to the Commission in the Philippines. It was this particular phase of the situation that I spent some two months in investigating, as a practical expert, for it was clear to me that there was some error in the details of cost. The honorable Secretary of War, in his testimony before this committee, conclusively proved that at the low cost of production, as advocated by our opponents, the Filipino planter could have made enormous profits by shipping his product to this market, yet for the ten years only a paltry average of from 4,000 to 5,000 tons came over here. With a great market waiting for the goods and a magnificent profit on the cost, they failed to increase their product, and instead actually kept going deeper into the hole, finally striking the bottom, and were buried under the avalanche of debts. Mr. Palmer, in his primer or catechism for the beet-sugar manufacturers, lays great weight on the cost of 95 cents per 100 as given by the Philippine Sugar Estates Company. Maybe they are right, but despite this abnormally low cost and corresponding high prices in the world's markets this company went into liquidation.

Señor José Puig is owner of sugar hacienda "Inaun," located at San Fernando, Pampanga. The depth of soil on his estate averages 3 feet and is plowed to a depth of 6 inches. The lands, like most of those in Pampanga and the plain extending northward from Manila Bay, are about at sea level, being so low that proper drainage is impossible, so that with a wet season the water remains on the ground and drowns out the growth of the cane. This condition, existing up to above Angeles, is a disadvantage which in the course of time will kill the cane industry in Pampanga and bring the lands under rice cultivation, for which nature has adapted them. The wage system under which Mr. Puig operates his estate is as follows: The owner supplies the land, house, carabaos, plows and seed, and other tools and necessities, and the colono receives in return one-half of the product in rice and half of the sugar, less 10 per cent for the cost of manufacture. During the season the colono receives a monthly advance of 5 to 7 pesos to meet his minor necessities. Under this system it is extremely difficult to arrive at any fair rate of wage, as the accounts of both sides are a tangle which would puzzle a "Philadelphia lawyer." Now, this system is similar to what obtains in Cuba under the central factory system, where the factory owns the land. The average price paid to the independent farmer in Cuba for his cane delivered at the mill is 5 per cent of the weight in sugar, or its equivalent in cash at the current market price. When, however, the factory owns its lands, and labor is scarce, they make a contract with a farmer to cultivate so many acres, supplying him with land, seed, cattle, tools, carts, and money advances, and pay for the cane at the same rate as paid to the independent farmer, and divide the returns with their colono, and yet there is no complaint made there that the colono is enslaved. He can break the bargain whenever it becomes unprofitable to him or whenever the factory fails to carry out its part of the contract.

Under this share system, as obtains in Pampanga, the actual cost is only known at the end of the season by the difference between expenses and receipts, and last year, when sugars sold at an average of ₱6 per picul, the planters acknowledged to have made a little money.

For instance, Mr. Antonio Consenja, owner of the hacienda "Magliman," at San Fernando, admitted that last year he made ₱1,500, which really was not a profit, but simply the amount left to him as overseer and manager of his own estate and factory. This is a sample small mill. His plantings were sixty

balibas, or acres, which yielded 900 piculs of sugar, an average of 15 piculs per baliba. The cane is planted in rows 2¼ feet apart and 1 foot between seed, and he never had a rattoon crop. The mud from the beds of the rivers is dredged out and scattered over the lands to serve as a fertilizer. His factory equipment is a small 6-horsepower 3-roller mill and engine, with three open batteries of five kettles each. His estimated cost was difficult to ascertain, but he opened his books in the presence of the governor of the province, which showed that this apparent profit on 900 piculs, at an average selling price of of ₱5.50 per picul, was ₱1,500. In other words, he had this amount as between his expenditures of ₱3,450 and his receipts of ₱4,950, or an average cost of ₱3.63 per picul, which did not include any salary for himself or allow for loss in cattle, interest, etc.; so it can be fairly estimated that his cost was ₱4 per picul.

Mr. Joaquin Lingiano, of the hacienda Santo Tomas, at San Fernando, testified to me in the presence of the governor that he had planted the year previous 120 balibas, from which he had secured a crop of 1,200 piculs, or 10 piculs per acre, or 1,375 pounds of sugar, and in bad years it was much less. His outfit was a little 6-horsepower mill and engine, with four batteries of kettles, averaging 30 piculs a day output. His accounts showed that he had sold his crop at an average price of ₱5 per picul, or a total of ₱6,000, and his apparent profit had been about ₱1,200, or ₱1 per picul. As he was working on the share system, it was pointed out that one-half of this profit went to the colono.

Mr. Juan Nepumaceno, operating a small steam mill at Angeles, stated that for the crop of 1905 he had planted 220 balibas of land, from which a crop of 2,520 piculs had been secured, or something like 11 piculs per acre, or 1,507 pounds. His books showed that he had received an average price of ₱6 per picul, or a total of ₱15,120, and acknowledged to have made a profit of ₱3,000, or a cost of something like ₱4.80 per picul. His lands have to be planted alternately with rice and sugar, so he only secures a crop of sugar every two years. This yearly planting would naturally raise the cost somewhat.

I might go on and cite several such instances, but I desire to include as an appendix two distinct detailed costs of making sugar, which will elucidate the point, while not taking up the time of the committee.

Now, Mr. Hathaway and others claim that the cost is somewhere nearer a cent than a cent and a half, and I do not wish to attack his good faith, as these were probably the costs he received from parties who looked upon him as a possible investor, and it might even be granted that in some instances the costs from the books could be brought down to a cent a pound or less; but, gentlemen, if we accept that cost, I want to say that it is only possible by the planter failing to pay his labor and is a strong indication that in some places the old system of peonage has not yet been eradicated. There are on some estates a certain proportion of labor who live there with their families, their forefathers have lived there before them, and it is the only home they have. They receive land, rent, and house free and rice from the owner, and also a small stipend. You can't drive them away, and they prefer to stay where they are known than to go somewhere else where they would be compelled to work harder. But this condition is only transitory, it can not exist indefinitely under the new order of affairs, and in looking into the future under American rule we must face the question of paying for the labor, and when we estimate the cost through all its details it will readily be seen that sugar cost of less than a cent is only possible by defrauding the native.

The divergence of figures between 1 and 1½ cents is not so great and might also indicate the location or accessibility of the lands and their proximity to a shipping port. The costs of beet sugar, as testified here, vary from 3½ to 4½, or over a cent a pound, so it is fair to assume that a variation of a cent can also occur in the islands, or from 1 to 2 cents, with 1½ as the average.

But the present cost of sugar has nothing to do with the future and is only cognate to the discussion as showing that the planters need relief, for with changed conditions, central factories, and modern methods entirely new conditions and estimates come to the fore, displacing the present cost and its relation to this bill, and our only real topic or argument is what the future holds out.

Theoretically, on paper, it can be demonstrated that sugar in the Philippines can be produced at 1 cent, but, like everything theoretical or prospective, it does not work out in practice. In Cuba the theoretical cost under the most favorable conditions is 1¼ cents, but the actual average in practice is over 2 cents, and with beet sugar it is fair to assume that the theoretical cost is rather below 3 cents; but, if we accept their statements, it has not materialized in practice. In the prospectus of new companies it is placed at 3 cents to secure stock, and in 1899 Mr. Oxnard quoted 3 cents as the cost of making beet sugar, to promote his construction company, and later had to acknowledge he was wrong. So the same old rule must work out in the Philippines and instead of a theoretical cost of 1 cent or less, as given out to influence capital, the actual working cost is nearer 1½ or 2, if we include interest, depreciation, etc.

Average cost in Pampanga.

[From data secured by George Bronson Rea.]

Lands under cultivation (approximate).

Yield of Muscovado sugar per "balita," maximum 20 piculs, minimum 15 piculs.

Crop of 1904, 2,100 piculs or pilones.

Value of lands, based on yield of 15 piculs=₱40 per balita.

PLANTING EXPENSES.

Plowing 1 balita, 1 man and 2 carabaos, with native plow, average ₱2 per time, 5 plowings, at ₱2	₱10.00
Harrowing, 2 times, at ₱1	2.00
Furrowing, 1 time, at ₱1	1.00
Drainage ditches	3.00
Planting 10,000 points	2.00
Hoeing and weeding	7.50
Total	25.50
Yield of balita, 15 piculs; cost per picul	1.70

CUTTING CANE.

Work paid for on basis of each 10 piculs of sugar manufactured at mill, called a tarea or task, per task	.75
Food cost for above	.20
Cartage to mill, per task	1.00
Food cost for above item	.40
	2.35
Cost per picul	.235

MANUFACTURING EXPENSES.

Capacity of mill, 85 piculs per day.

Average day's work, 30 piculs per day.

Engineer (salary), per month	30.00
Fireman (salary), per month	15.00
	45.00
₱45 / 25 working days × 30 piculs per day, per picul.	.06
Mill men: 10 men, at ₱0.12½ per task and food; 10 men in a shift, at ₱0.20 per day and food = (10 times ₱0.125 + ten times ₱0.20) / 30	.11
Sugar boiling: ₱2 per task, or ₱0.20 per picul	.20
3 men to battery × 6 batteries=18 men; 2 sugar boilers=20 men × ₱0.20=₱4 food cost 4.00/30 = per picul	.13⅓
Six firemen for six batteries (wage, 0.30 + 0.20 food=0.50), six times 0.50=0.10 per picul	.10
Fuel, ₱4.50 per day=per picul	.15
Hauling to town, per cartload of 7 piculs =₱2.00=0.285 per picul	.285
Food of engineer and firemen	.013
Pilon (container)	.50
Lima and oil	.05
Freight to Manila	.20

Planting expenses	₱1.70
Cutting and hauling	.235
Manufacturing	.766
Hauling to town	.285
Container	.50
Lima and oil	.05
Freight to Manila	.20
Overseer or owner's wages at ₱1.50 per month =₱1,800 per year= 1,800/2,100 = per picul	.85
4.58/137.5 per pound = ₱0.033, or United States currency, $0.016 per pound	4.58

COSTS IN NEGROS.

Now I want to submit a fair sample of detailed cost of making sugar in the island of Negros, and call your atttention particularly to just where the opposition have made their error and also where the average Filipino planter errs in computing his actual costs.

In Negros the unit of land measure is known as the "lacsa," comprising 10,000 plants or stands of cane on a plantation. When crops are good a "lacsa" of new land will produce an average of 30 piculs, when poor about 15 piculs, while on the older lands the general average is about 16 piculs, or 1 ton. There are 3 "lacsas" of cane seed to 1 hectarea of ground, or equal to five-sixths of an acre.

There are some new lands that give still better results, and there are others that fall far short of this average, but, generally speaking, 20 piculs per "lacsa" in what are classed as average harvests. On this fair average basis we will make an estimate for a plantation of 200 "lacsas," a 4,000-picul harvest, commencing with the expense of cultivation, milling, packing, and transportation, until the product is placed on sale in the market for the farmer, or, in other words, in the port of Iloilo, and it must be remembered that though the work of preparation is usually less costly in soft ground, there are other lands on which the expenses run much higher than those which are here set forth:

Planting and cultivation.

[Expenses per "lacsa."]

Four preliminary workings of ground	₱12.00
Planting or seeding	4.00
Three plowings and cleaning of plants	13.00
One final working	5.00
Total	34.00

The ₱31 for expenses of cultivation per "lacsa" will give us ₱1.70 per picul.

Cutting and manufacture.

[Expenses per picul.]

Cutting and carting of cane	₱0.35
Sun drying of bagasse	.10
Ovens and mill	.27
Total	.72

Packing and transportation, etc.

[Expenses per picul.]

Bags and rattan	₱0.13
Packers	02
Carting to wharf	.25
Lighter transportation	.20
Expenses of delivery in Iloilo	.10
Agent's commission, Iloilo	.10
Total	.80

SUMMARY

Cultivation, per picul	₱1.70
Milling, per picul	.72
Transportation, per picul	.80
Total	3 22

or an apparent cost of ₱2.30, or $1.15, per 100 pounds.

Now, if we rest on this as the final or absolute cost we would be greatly deceived, as much deceived as the planter who stops here with his details. It is true that the above is a fair average of general expenses, for in a reunion of planters held at Bacolod under the direction of the provincial governor they all more or less agreed on the point that the cost to plow, plant, and cultivate a "lacsa" would average ₱34, and I also ascertained, by a practical example on Señor Luzuriaga's estate, that the cost of cutting, hauling, and manufacturing was 80 cents per picul, by contract, as that was the price agreed upon with the contractor under which the crop was being harvested. In Mr. Luzuriaga's case I figured his bare costs down to ₱2.50 per picul, but, as in the estimate submitted, there are many other items which have been omitted entirely—the salary and maintenance of the manager and the permanent salaried force, oil, light, expenses of the plantation house, veterinary charges, repairs, commissions to labor contractors, loss of cattle, and other minor legitimate and necessary items. Without going into all of these, but just taking up the most prominent, we find on revision of the above as follows: A plantation to

produce 4,000 piculs, with the expenses already noted and the following, will be:

Costs of 4,000 piculs as indicated, at ₱3.22	₱12,880
Salary of manager	1,000
Salary of assistant	480
Maintenance of above, at ₱50 per month	600
Four outside foremen, at ₱15 per month	720
Maintenance	288
Rice for laborers (500 piculs, at ₱5.50)	2,750
Light, oil	60
	18,778

Or a cost per picul of ₱4.69.

And yet we have failed to include interest, repairs, depreciation, taxes, and other legitimate charges which are always difficult for any outsider to secure, but the above is ample corroboration of the costs as advanced by those interested in this measure, and it will be seen all the way through that the wages are kept way low, with the rates prevailing in other years.

And yet we have failed to provide for the loss of cattle through epidemic diseases. In 1902 about 40 per cent of all the work cattle died. As a concrete example, which will appeal to the members of this committee who visited the islands and were entertained at the estate of Mr. Lacsos, at Talisay, I might state that I visited the place just about a month after their departure from the islands, and I found the rinderpest had again broken out, and on Mr. Lacsos's estate out of a total of 250 head of carabao 65 animals had already died of the scourge. Other planters also lost a similar proportion, but the board of health was overcoming its further spread. Now, a fair carabao is worth ₱150, or $75 gold, so we see that in less than one month Mr. Lacsos's loss in this one item amounted to $4,875 gold, or his entire profits from his small farm wiped out for the year.

There is a belief, and although erroneous it is persisted in, that sugar is produced at a little more than ₱3 a picul, and from this hypothesis, based at times on the testimony of farmers but little familiar with accounts and absolutely indifferent to the practical result of their exploitations, arise the prejudices which so seriously injure this industry.

At other times, when carts used to cost from ₱25 to ₱30, a good carabao, or ox, ₱50 at most, transportation and freight much less than to-day; when help could be had at smaller salaries, and when everything else was in the same proportion, a picul of sugar came out at ₱3 or more, indeed, rather than less. There was then no land tax, no tax on carts used on plantations, no tax for the re-marking of cattle, all of which tend to increase still more the cost of a picul of sugar. There were roads and bridges which, though poor, made the carting more economic than now, when there are neither good nor bad.

Even this sample statement of costs is open to wide variations, depending on the haul or transportation charges, due to the distance to the coast, and when we vary the yield per "lacsa" and bring it down to the lowest or poor year the costs double.

It is not difficult to analyze these costs and convince yourself of their correctness. Starting on the basis of plowing a "lacsa," or, roughly, an acre of land, we have a cost of ₱3 per time, or $1.50 gold. Now, it usually takes a good frisky carabao and his affinity, the tao, about five days to get over this amount of ground in haste, or an average wage cost of 30 cents per day, or about the basis which it is claimed he is receiving. Parting from this basis it can readily be seen that the estimate is a fair one.

Now, gentlemen, I am going to ask you to exercise simple common sense in deciding which side is correct in this question. I don't request you to take my word or believe my statements unless you so wish, but I do ask you to stop and consider this matter of costs from the evidence submitted. It has been clearly demonstrated what the great profits would have been had the Filipino planter produced his sugars at less than a cent a pound, and yet we see that they have been tobogganed to ruin and bankruptcy. Delegations have submitted their detailed costs in the hearings at Manila, Mr. De la Rama has again reiterated his statements here in Washington, and I have submitted the results of my investigations, and the burden of all the evidence is that it costs about $4 per picul, or 1½ cents per pound to manufacture and deliver Filipino sugars to the port of shipment.

Let us turn to the last page of the published hearings before the Ways and Means Committee of this session and look at the final affidavit submitted by Mr. John Heil, the superintendent of the government farm and experiment station at La Carlota in Negros. This is official, and it states that the yield per acre was 1¼ tons of sugar, and that the cost per picul landed at Iloilo was $9.50, or over 3 cents gold per pound.

What does this indicate? The first impression is, that if the Negros planter is producing his sugar at 1½ cents and the government farm at double that cost, the management of the latter is not efficient and the methods open to investigation. But this idea is erroneous, as it simply indicates what the real cost of sugar would be throughout the entire island on a similar scale of wages and transportation charges due to distance from the coast. If this difference in cost existed in the management of a modern central factory, you might well charge extravagance and inefficiency, but with the most rudimentary methods, calling for a minimum amount of intelligence, it simply demonstrates the difference in costs as affected by the higher scale of wages, the employment of modern farm machinery and American mules versus carabao, and intelligent, well-paid supervision, and high costs offered. Here the scale of wages and transportation charges are considerably higher than that paid by the farmers, and we have as a result a proportionate increase in cost.

So we have verified and supported our side of the case by two powerful comparisons; first, we have shown that under identical conditions as to wages, yield, and machinery the cost in the Britisth West Indies, as sworn to by competent witnesses before the West India royal commission, averaged the same as in the Philippines, or 2 cents per pound, and we now see that right in the islands under government supervision and control, working with improved implements, scientific cultivation, and a higher wage, the cost is just doubled, or 3 cents.

Gentlemen, I rest this point, with confidence in your sense of fairness as to which side has stated the truth.

Now, gentlemen, let us look at the actual conditions of crop and yield as obtains in the Philippines to-day. What are the yields per acre in sugar, and what is the tonnage of cane? The yield of sugar per acre is a known quantity, and varies greatly in different parts of the islands, owing to difference in soil conditions, climate, species of cane, density of the juice, and the mechanical apparatus and process employed in working up the product.

The first requisite of good cane to give the maximum yield in sugar in any process depends upon the density and purity of its juice, and this is naturally in turn dependent on the soil and climatic conditions, and whether the cane is allowed to ripen properly before cutting.

Now, it has been intimated here by Mr. Humphrey that we did not know in the Philippines anything about our cane, or whether we are getting one-half or one-fourth of the possible total of sugar in the cane, as no analysis had ever been made to determine the point. As a matter of fact, personally, I have never seen any polariscopic tests of the cane juices, so as to determine the average percentage of sucrose, or sugar; but, given the density of the juice, experience in other countries determines for all practical purposes the proportion of sugar contained. As this item plays an important part in reaching a definite conclusion on our possibilities, I shall submit here the results of several years' tests made in Negros by an English sugar chemist, Mr. Crick, giving the average densities of juice in degrees Baumé for the different parts of the province during different months:

1. Northern Negros:
   November,—6° to 6.7° Baumé.
   December to end of crop (if very dry),—9° to 10°.
   Exceptional (hard cane,)—11.4°.
2. West Negros:
   November,—6.2° to 6.8°, improving to 9° to 9.7°; exception,—10°.
3. Central Negros:
   November,—7° to 8.5°, improving to 11°,
   Small patches in foothills give 11.5°.

Mr. Crick also furnished me with the following data on the yields of sugar per acre from his own observations:

Northern Negros.—Average yield, 1½ tons per acre. Maximum yield, on isolated patches, 2½ tons per acre.

Western Negros.—Average yield, 1¼ tons per acre. Maximum, 2½ tons per acre.

Central Negros.—Average yield, 1¾ tons per acre. Maximum, on foothills, 3 tons per acre.

And, while I am at it, I will also give the results of his polariscopic tests in Iloilo on the sugars resulting from the above crops. I may mention, incidentally, that Mr. Crick is the deputy collector of customs at Iloilo and the only person in town owning a polariscope. His results show that 80 per cent of the Negros sugars polarize from 70° to 79°; 10 per cent polarize from 79° to 84°; 10 per cent (superior grade, not polarized) sold on degree of dryness and color.

The tests of juice in Pampanga show a much lower density than in Negros, owing to the lands being low and improperly drained.

In Pampanga the official returns of the census give the average yield per acre as 1,100 pounds, while my own investigations fixed it at 12 piculs per balita, or acre, equivalent to 1,800 pounds. The process of manufacture is the old, crude, muscovado sugars, extracting about 50 per cent of the juice of the cane. This process at its best, under these primitive conditions, will return in sugar; about 5 per cent of the weight of the cane in Louisiana, with the same process, it is 4½ per cent. So it is readily seen that when only 1,500 pounds of sugar is secured per acre, or 5 per cent of the cane, the latter or yield per acre will be 15 tons, and 18 tons when 1,800 pounds are secured. This firmly established, what can be accomplished with a modern factory, securing an average of 10 per cent, or double the above, in Pampanga.

My attention has been called to the fact that in Negros a different method is employed in making sugar; that instead of draining the molasses from the cooked mass, as in Pampanga, it is boiled down to a point where, on cooling, there is no molasses secured, and therefore the average yield in weight of the cane is much higher or nearly double and my statement of 5 per cent should really be 10 per cent, and therefore the lands in Negros are now yielding in concrete sugars the same tonnage as they would with modern machinery. There is much truth about this phase of it, and taking all average conditions into consideration it might reasonably be stated that in Negros they are securing some 9 per cent instead of 5 per cent in sugars; but the grade of the sugars decrease in proportion. It could be readily proven just what the proportion is, and consequently instead of doubling the tonnage per acre by modern methods the crop would remain, the same, and the statement of the best people about the possibilities of our lands refuted. (Wiley.)

It may be said that the sugars of Negros approximate what is called in trade "concrete," owing to the molasses being boiled down with the grain, naturally increasing the weight or yield. They are sold, however, under the classification of muscovados, but the grade is so low that little of it is bought by the American refineries. The very low grade sugars, or below 80°, being so filled with impurities, ash, etc., are not handled by all refineries, and, as a matter of fact, the only refinery of the trust which refines this product is one located at Jersey City. There is such a preponderance of 96° sugars now made in the world that the refineries will not buy the very low grades, except to fill a limited demand for certain grades of sugar. The great bulk of the crude sugars of the West Indies finds its way to the Arcadia Refinery, at Halifax, for the Canadian trade.

This fact notably explains just why such a small proportion of the Philippine crop has come to this country, and just why the proportion can not be increased under the present methods of manufacture. Mr. de la Rama states that five-eighths of the crop in the Philippines is below 80°, two-eighths from 84° to 85°, and one-eighth from 87° to 88°, or a slight divergence from the proportions given by Mr. Crick, of the Iloilo customhouse. However, the point is clearly apparent that at least three-fourths of the Negros crop is of such a low polarization that it can not find a market in the United States, except at a very low price, and when we take the average polarization of 84°, as has been the case here in these hearings, this really represents only about one-fourth of the product, the balance being anywhere from there down to 70°. Now the trade discount on the market price of 89° test for each degree less is 0.1 cent down, so when muscovados—89° test—are quoted at 3⅛ cents, 84° sugars are worth 0.5, or ½, cent less, or 2⅝, and when we get down to a basis of 79° it is another ½ cent off, or 2⅛, and when down to 74° the price is 1⅝ cents, or a sugar without a value; that is, having no demand except in China and Japan.

The difference between the sugars of Pampanga and Negros can be better appreciated by the following example, based on a market value in New York of 3⅛ for 89° test:

In Pampanga the planter receives 5 pounds of sugar and about 5 pounds of molasses from his 100 pounds of cane, the sugar polarizing 89°, and worth, therefore, 15⅝ cents plus the value of the molasses for making rum, but it necessitates three to four months for the sugars to drain.

In Negros the planter receives 9 to 10 pounds of sugar from his 100 pounds of cane, polarizing from 88 to 74, with an average value of 2 cents per pound, or total of 18 to 20 cents for his product, and no molasses.

We find, therefore, that for each 100 pounds of sugar, instead of an average price of 2⅝ cents on 84° test, the real price to the Filipino duty, paid at New York, is as follows (on a value of 3⅛ 89° test):

10 per cent of 88°, at 0.03025	0 3025
10 per cent of 84°, at 0.02625	.2625
40 per cent of 79°, at 0.02125	.8500
40 per cent of 74°, at 0.01625	.6500
Average per 100 pounds	2.0650

So instead of an average of 2⅝ the real average is at least five-eighths of a cent less, or about 2 cents per pound, and it will help to explain just why the planters have been losing money. This may also demonstrate to this committee why so little of the Philippine sugars have come to this market, and why these low grades will not come in the future, and why they will go to China, where there is a demand for them.

It is a fact that the 30,000 or more tons now stored in New York has found no buyers, or it is possible it would have been sold long ago.

This point alone is proof positive that our exports to this market will not materially increase over the old standards, and any great increase must come from the 96° product of modern mills.

The statistics of exports from the Philippines from 1896 to 1905 show that out of a total tonnage of 1,182,364 exported from the islands 282,000 tons came to this country, or about 25 per cent, the balance going to the nearby markets These figures are further proof that only 25 per cent of 84° to 88° grades are salable in the United States, and the 75 per cent of the lower grades find their inevitable outlet to the only countries where it is consumed in a crude state, where the lower the price the more acceptable the product.

So the doubling of our present crop and the exportation of it to this country is quite a formidable matter and must come from a great increase in the number of factories.

With the drained muscovado system in Pampanga the yield of cane per acre is roughly about 18 tons, and in Negros where they make concrete the yield may be estimated from 7 to 10 per cent on the weight of the cane, so that with modern methods the yield could not hope to double the present in tonnage, but would in value. We find in Negros that the average yield is 2,800 pounds of sugar per acre, which means 14 tons of cane to the acre, though in newer lands removed from the coast this average is about doubled to 30 piculs, or 5,000 pounds per acre, or 25 tons of cane, the world's average.

So in getting down to a basis for future work we can safely estimate the lands of the Philippines to yield an average of some 25 tons of cane and perhaps in the new land to rattoon for three or four years, placing us in the same relative position as Porto Rico.

Now, gentlemen, we have discussed this question from all its practical points, and have clearly demonstrated where the opposition is in error and their menace only a hallucination conjured up by their own brains, but in all my comparisons I have carefully avoided any reference to the existing margin of full-duty-paid sugars entering this market and fixing the price, basing my comparison of costs on the time when this margin and the greater margin of Cuban sugars are wiped out.

We have, according to last year's statistics, a margin of 438,000 tons of full-duty-paid sugars, to which must be added the accepted yearly ratio of increase in consumption of some 80,00 tons, or a margin of 510,000 tons of full-duty-paid sugars to work on for the year.

Now the point has been raised by the opposition that this 500,000 tons is fully taken care of this year by the estimated increase in production, but I submit, gentlemen, that an estimate figured out at the beginning of a crop or the commencement of a year seldom comes true, for there are innumerable conditions which can arise during the year to vary it. Early estimates, based on prospective plantings or possible yields are generally misleading, and crop statistics vary from week to week with weather conditions and other causes.

Last year, owing to abnormally high prices, the plantings for this year were unduly stimulated, but the market has since gone back to its normal condition, and this year with low prices the pendulum will swing back and the old order of affairs prevail. It is decidedly unfair to take such an estimate as one to base their argument on and hold that this year's increase will establish a new basis for supply. As a matter of fact the estimated increase for this year, as stated by Mr. Humphrey, is in direct contradiction to the statistics, for we find in Willett & Gray's circular as follows:

Sugar crop.

	1904–5.	1905–6.
United States (Louisiana and Texas)	350,000	312,000
Hawaii	380,000	370,000
Porto Rico	145,000	210,000
Cuba	1,163,258	1,300,000
Beet crop of United States	209,722	285,000
Total	2,247,980	2,477,000
		2,247,980
Increase, 1905–6		229,020

The consumption of sugar last year was lower than the previous year, owing to the high price, and it is only fair to assume that this year, with the lower price and increase in population, the consumption will swing back to that of 1904 plus the average ratio of increase, or 2,767,162 plus 80,000 plus 80,000, or a total of 2,927,162 tons. So that even with the high estimate of the increase in production of 2,477,000 there will still be a deficit of 450,000 tons to come from the Philippines and elsewhere. I think I have conclusively proven that only the average proportion of 25 per cent of the higher grade Filipino product will continue to come to this country, even under free trade, so that for several years at least it will not cut any figure. Now, it is plain to be seen that we have a margin of something like 400,000 tons of full-duty-paid sugars plus the annual increase of 80,000 tons to work on and develop before the present market values are affected. I have pointed out the difficulties existing in Hawaii and Louisiana, and stated why their development had reached its limit. The crop of Porto Rico may advance to 250,000 tons in a few years, but not until new factories are erected, and that takes time, and then that island will have reached the limit of its resources. Cuba will swing back until her labor question is settled, so the real fight to supply the 500,000 tons plus the annual ratio of increase of 125,000 to 150,000, which comes over the garden wall, will dwindle down to one between the beet and the Philippines. In the ordinary rate of progression, with the beet cost of production being steadily lowered and the cost in the Philippines steadily increasing, it will take several years before this margin is wiped out, several years yet before the average market price for refined will drop below the average of 4½ cents as maintained now by the refineries on the full-duty-paid sugars.

Then we get down to the basis of the 20 per cent reduction on Cuban sugars, and the price will be reduced 33 points accordingly, or a possible price of $4.17 per 100 pounds. This still gives a good profit to the beet, for by that time they will be making sugar at 3 cents per pound, and if they are not they have a hopeless case—they ought to get out of business. Now, in taking this view of the future, I assert it is simply a gamble, for the chances are 10 to 1 that when the Cuban reciprocity treaty comes up at the end of three years for renewal it will not be ratified, and instead of the price dropping 34 points it will remain at the old figure and bring the margin of full-duty-paid sugar up to over 1,500,000 tons for the home industries to expand in.

Now, again, as a matter of fact and common sense, so long as the refiners control the market and set the price there is no danger of the beet industry being wiped out, and one of the most remarkable incidents in these discussions is the open hostility and animosity voiced by the beet-sugar people against the refineries, whom they have every reason to bless for favors bestowed in the past and to receive in the future. The price of raw sugars can never get below the lowest cost of production and delivery at New York, which can be roughly taken at 2 cents, or the world price. Anything lower than this means the extinction of the tropical industry, for at a cost of 1.4 cents in Java, 2 cents in Cuba, 2 cents in Hawaii, 1¾ cents in Porto Rico, and the same in the Philippines, anything less means the ruination of the industry. To this 2 cents must be added the lowest duty, or the Cuban 20 per cent reduction, or 1.34 cents, making 3.34 cents. Add the refiner's cost to refine and his margin of profit, the difference being about $1, it brings the cost to $4.34 at New York, plus 49 cents to the Missouri River, or $4.83. This is the cheapest that refined cane sugar anywhere can come into competition with the beet, and is the price which prevails at present approximately. Any great lowering of this cost is impossible, without putting either the refiner or the cane-sugar producer out of business, and as long as there is a demand for refined cane sugar, so long will the beet people be under obligations to the refiner and his tropical brother farmer. And this will always be the case, for beet sugar can never wholly displace the cane, as it is not suitable for many purposes. I would like to read what Doctor Wiley had to say on this point before the Ways and Means Committee:

"The question of the relative character of the two sugars comes also into this discussion. 'Are they identical?' This is a question which has been asked me hundreds of times. I will say, in reply, that the pure sugar made from cane and made from beets is identical in every particular, but the raw sugars are wonderfully different in their composition; so it is only the absolutely pure sugars which can be regarded as identical. Therefore, al-

though this table shows the rapid relative growth of the beet industry, it does not mean by any means that the beet industry can ever drive the sugar-cane industry out of existence, although a great many people calmly speak of the possibility of such an event in the future—that is, that the increase in the beet-sugar industry will be so great that the industry of making sugar from sugar cane will cease.

"There are, however, certain uses, based upon the properties of the two sugars, which can not be interchanged. For instance, for commercial purposes, for baking purposes, for preserving and other similar purposes, the raw beet sugar can never take the place of the cane sugar, for the reason that beet sugar in its unrefined state is scarcely fit for human consumption, either directly or in the cuisine.

"This is best illustrated by two samples which I have brought, such as are taken every day for polarization for the purpose of ascertaining the rate of duty to be imposed upon imported sugar. I wish the committee would simply open these two cans and smell each one, and you can then understand the force of my argument and understand why it is that a raw beet sugar can not be used for commercial purposes, while a raw cane sugar can be. So, for the great preserving industries, for making jams and jellies, and for baking cakes, where low-grade sugars are preferred, the beet sugar can never take the place of the cane sugar. Therefore, the cane sugar, in spite of this relative increase in magnitude of the two industries, can never be driven from the markets of the world.

"I will show, as the hearing proceeds what the cause of this remarkable increase is.

"Now, Mr. Chairman, you might think that when you refined that article this difference would disappear. But I can tell you, and so can any expert in sugar, whether a refined granulated sugar is made from cane or whether it is made from beets.

"Mr. McCLELLAN. Without analysis?"

"Doctor WILLEY. Without analysis. You simply need to place such a sugar in a jar, only partly filled, and stopper it for twenty-four hours. Take a perfectly white sugar, polarizing almost 100, made from beets. Place it in a jar, stopper it for twenty-four hours, take out the stopper and smell it. This odor, like the odor of the roses in the broken vase, 'will hang round it still,' even in the refined state, as it is sold in commerce."

If it were not for this difference in quality between the beet and the refined cane products, which prohibits the use of the former in many instances, the beet product would ultimately control the situation and dictate the prices or force them down so that the latter would have to go out of business. The parting of the road has already passed, for the cost of producing refined beet sugar is already so low that the refiners can not compete with them at the Missouri River. It has been clearly demonstrated that in many instances the beet cost is less than 3¾ cents, while the raw cane product is worth, duty paid, 3.625, to which add the refiner's cost of 0 625, and we have 4¼, without profits or freight charges. As the beet cost declines and cane increases this variance will be greater, and the beet manufacturers will displace the refined cane in all but the Atlantic seaboard and yet continue to take advantage of the market as made by the trust.

When the beet cost is lowered to less than 3 cents their product will soon find its full market and increase accordingly, and while taking advantage of the New York market in price will so regulate it to undersell it by the difference in freight to various centers.

So the field is here for both of us, and as the beet-sugar farmer and manufacturer, under the stimulus of governmental help and direction, continue to better the product of their beets, as with new methods they reduce their manufacturing expenses and ultimately their costs, until they reach the golden era of 2 cents, they can bless the refiner and the cane people, who are holding up the market for them to over 4½ cents.

As Mr. Saylor, the Government sugar expert, so aptly stated in his testimony on the Cuban reciprocity treaty (pp. 533-534)—

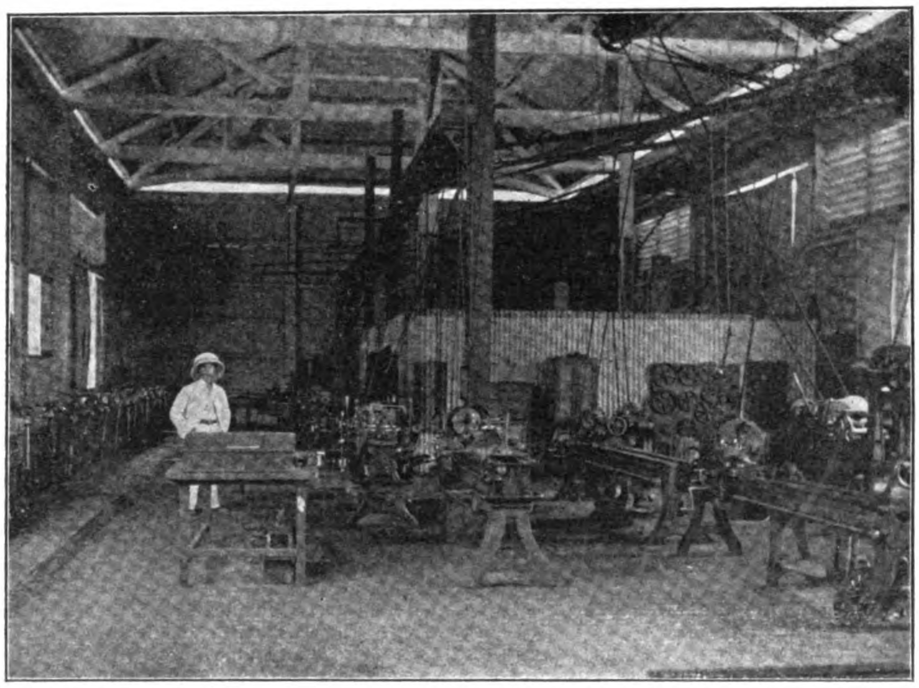
There is no doubt that the costs will be equalized. It is working to that point. There is no doubt but that it will have both effects—that our cost (meaning the beet) will go down as we become more effective in our work and methods and in understanding our conditions, and their cost (referring to tropical cane) will come up by reason of paying higher wages.

Gentlemen, I thank you for the indulgence shown in listening to my argument, and in conclusion I once more appeal to you to consider this question from its merits, feeling sure that an impartial study of the facts will decide the matter in our favor. Give us a chance in those far-away islands and we will develop them; we will in time repay to the country the millions spent in trying to improve them. We have out there the same type of Americans who built up the great West for you. Call them adventurers if you like, but they are the same old stock which made the expansion of our country possible. In company with the native, all they ask is the only thing one American can ask and expect to receive from another—a fair and equal chance. Don't discriminate against us. Don't tie our hands, but give us an opportunity—give us fair play. Give us a square deal, and we will do the rest.

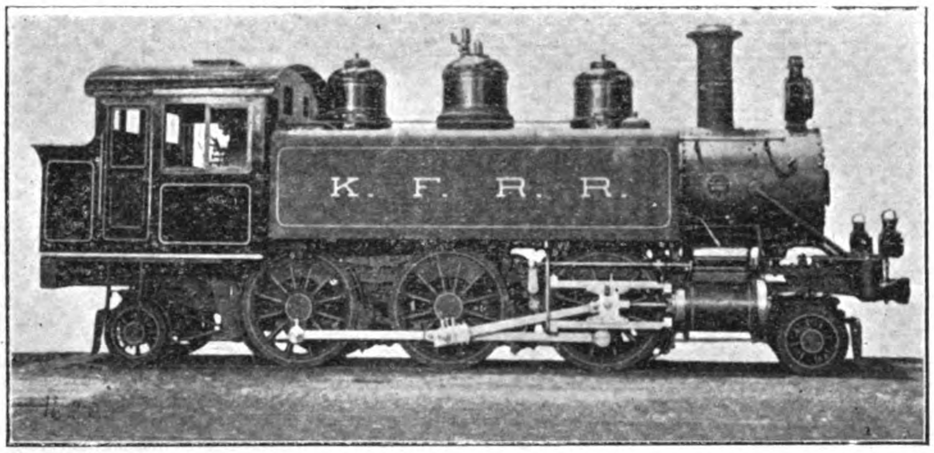
DEVELOPMENT OF SANDAKAN

Years ago our geography books told us that England's capital city was London, also that Birmingham was a large and prosperous city. Since that time Birmingham has become a much larger and more prosperous city, but London still remains old England's capital, and when many other cities have sprung up and become great, London has never worried herself; she has just gone on making herself even more and more beautiful, and has steadily helped those other cities to become great and prosperous, without robbing herself of one iota of her own greatness; and so in a very small way with us here. To those of us who have been away from Sandakan, and not seen her for the last two or three years, the advancement and improvements everywhere are remarkable. We who have had the opportunity of watching the rapid growth of our West Coast town, Jesselton, and have seen the gradually increasing trade opened up by the Railway, which will in the near future make her, too, a much larger and more prosperous town, are more than gratified to find that Sandakan has not looked to her laurels in vain: far from it, she is even more beautiful than ever before. To specify a few of the more marked improvements we must begin at the Wharf, where we find a new Office for the Superintendent of Customs, think what a relief it must be to get away from the old one and its close proximity to the boxes of "ikan kring." Then on into the Chinese town, and we find it cleaner and better looked after than ever before, several new blocks of shops, and more in builders' hands; the Gambling Farm as crowded as ever, a sure sign of prosperity; a better class of goods in the old established shops, but breathe it not, at the same old prices! We well remember this rate of exchange which knoweth not fluctuation! On passing from the town we find the Post and Telegraph Offices in new quarters, a very smart and business-like building, then on to the Printing Office, transferred (not to the Museum) but to the building once used for it, which seems to give ample space for the increased staff and output; on towards Fort Pryer, where we come across Messrs. The China Borneo Co.'s Slipway, a boon to our own as well as our neighbors' shipping, which occupies the land and foreshore which was formerly the resting place of the flotsam and jetsam of Sandakan town, until we arrive at the Eastern Barracks, an entirely new building and an enormous improvement on the old one. On our way back the roads call for mention, in fact the roads everywhere have been graded and widened, corners cut off and the old washouts properly drained. The exterior of the Church looks practically finished and we hear that as soon as the windows are in, the old building inside, over which the nave proper has been built, will be removed, and expose to our view what we know to be a great ambition—a Stone Church in Borneo —the dogged progresss of the Church calls for our great admiration of a set purpose. No appreciation of Sandakan would be complete without noting what to us is the new Government House, lying in its beautiful grounds, in which it is easy to detect the hand of the expert gardener. We might mention many more actual improvements, but the foregoing show quite clearly Sandakan has made big strides forward in beautifying herself. She need never fear rivals to her claims to be the first town of British North Borneo, however successful or prosperous her sister towns may become. We wish them the success and prosperity she herself enjoys.

(British North Borneo Herald.)



INTERIOR OF MACHINE SHOPS, MANILA SLIPWAY COMPANY



TYPE OF AMERICAN LOCOMOTIVE IN USE ON THE SEOUL-FUSAN RAILWAY. BUILT BY THE BALDWIN LOCOMOTIVE WORKS

RAILROAD NEWS

SWATOW CHAO-CHOU-FU RAILWAY:—The railway which is to connect Swatow with Chao-chou-fu, the concession for which was given in December, 1903, to one Chang-yu-nan, a Chinese merchant, who has for many years been resident in the Dutch Indies, has not advanced as quickly as was hoped, owing mainly to the great difficulty the railway company has experienced in purchasing land. After the settlement of the Am-pou riot, in which early in 1905, two Japanese workmen were killed, work on the railway was again delayed by the opposition of the local gentry and merchants, who alleged that the proposed line of route threatened injury to existing water rights. The protest was supported by the villagers, the prices offered by the railway company for the land, based on the Luchan Railway regulations, not being considered adequate. The question was investigated by the Taotai and a Commissioner from the Board of Commerce, who decided that the complaint as to the injury to water rights was frivolous, but recommended an advance of about fifty per cent. in the prices to be given for the land. This compromise seems to have been satisfactory, and since August work has been proceeding more rapidly. An embankment has been made, and rails laid down as far as Ampou, a distance of about ten miles. The total length of the line will be thirty-two miles, and there are to be seven intermediate stations.

All material for the railway is supplied by the Japanese contractors, who have not offered any public tenders. The Japanese contractors for the railway are making a sad muddle of the work, and the shareholders are already beginning to question whether, when the accounts are squared up, the actual expenditure will be below the estimate of the English firm which was first talked of in connection with it.

THE PEKING-KALGAN RAILWAY:—Work on the Peking-Kalgan railway is progressing very rapidly under the charge of Taotai Chan, an American educated civil engineer, and it is expected that the whole line will be completed before the close of the year 1907 instead of 1908, as at first contemplated. Viceroy Yuan Shih-kai wishes it finished and opened to traffic as soon as possible with a view of having it extended to the Mongolian capital or Urga and beyond as far as the Siberian frontier. All the railway materials ordered from France have arrived at Tientsin and have been delivered to the railway administration which is under the directorship of Taotai Cheng. No foreigners are employed on this line.

KIANGSU RAILWAY CO:—The formation of the Kiangsu Railway Company, in connection with which a meeting was held on the 10th of June at Shanghai, has been made public. H. E. Wang Tsing-nur, Vice-President of the Board of Commerce, has been appointed the Director-General, and Mr. Chang Chong the Chief Adviser, of the same Board, as Director. The capital is ten million dollars, of which two million was subscribed at that meeting. The Company are to build railways throughout Kiangsu Province, but as a preliminary step the sections between Soochow and Kashing and subsequently Kashing and Shanghai are to be constructed.

SOOCHOW-NINGPO RAILWAY:—It is stated that the British Chargé d'Affaires is still working energetically concerning the Soochow-Ningpo railway concession, as the British and Chinese Corporation is desirous of connecting it with the Shanghai-Nanking Railway. A representative of the said Corporation has informed the Peking Government that if the line is built by his Corporation China can get it back in fifteen years, but if it is to be built by the Chekiang merchants, it will not be completed in thirty years.

FUKIEN RAILWAY:—Chen Pao-sin, a prominent resident of Fukien, who was appointed to manage the Fukien Railway, recently engaged two French engineers who are now surveying the road. The Japanese Minister at Peking has lodged a representation with the Waiwupu declaring that the construction of railways and opening of mines in Fukien ought to be done in consultation with Japan since China agreed that Fukien Province should not be ceded to any other country, and Japan's rights in arbitrarily engaging French engineers had been disregarded.

THE SANYO RAILWAY Co. held a general meeting in Kobe on April 28th. The net profit for the last half of 1905 was *yen* 1,528,408.16 to which a balance of *yen* 961,241.48, brought forward from the previous account, was added, making a total of *yen* 2,489,649.64. Of this sum, *yen* 76,500 was put to reserve, *yen* 13,500 was paid to employees as a bonus; *yen* 1,642,500 as a dividend at the rate of 10 per cent. per annum; and the remainder was carried forward to next account.

SEOUL-FUSAN RAILWAY:—It is officially announced that the State purchase of the Seoul-Fusan Railway will be effected on the 1st of July. This transaction will represent, it is believed, the only action which the Government will take during the present year under the provisions of the State-Purchase Law.

RAILWAYS IN KOREA.—The tunnel on the Seoul-Wiji railway at Chayuryong was completely finished on May 24th. The reconstruction of this line is gradually proceeding and will include a bridge over the Yalu River and the alteration of the gauge of the railway connecting Antung with Mukden to conform with the Korean railroads.

The light railway which is to connect Hamheung with the coast is also being completed.

TENGHYUEH YUNNAN LINE:—Exception is now being taken by the Chinese to the construction of the Burmah-Yunnan line by the British, and absurd petitions have been sent in from some quarters to the effect that the Chinese will build the line themselves. The Viceroy, however, is of the opinion that the utilization of British capital is all right providing a time limit be strictly fixed for the foreign control of the line.

SHANTUNG RAILWAY CO:—The traffic on the Shantung railway is gradually developing, and the daily earnings are increasing. The report for last year shows a very satisfactory state of affairs, the railway being able to pay, notwithstanding very heavy expenses a dividend of three and a quarter per cent., an increase of one per cent. over the previous year.

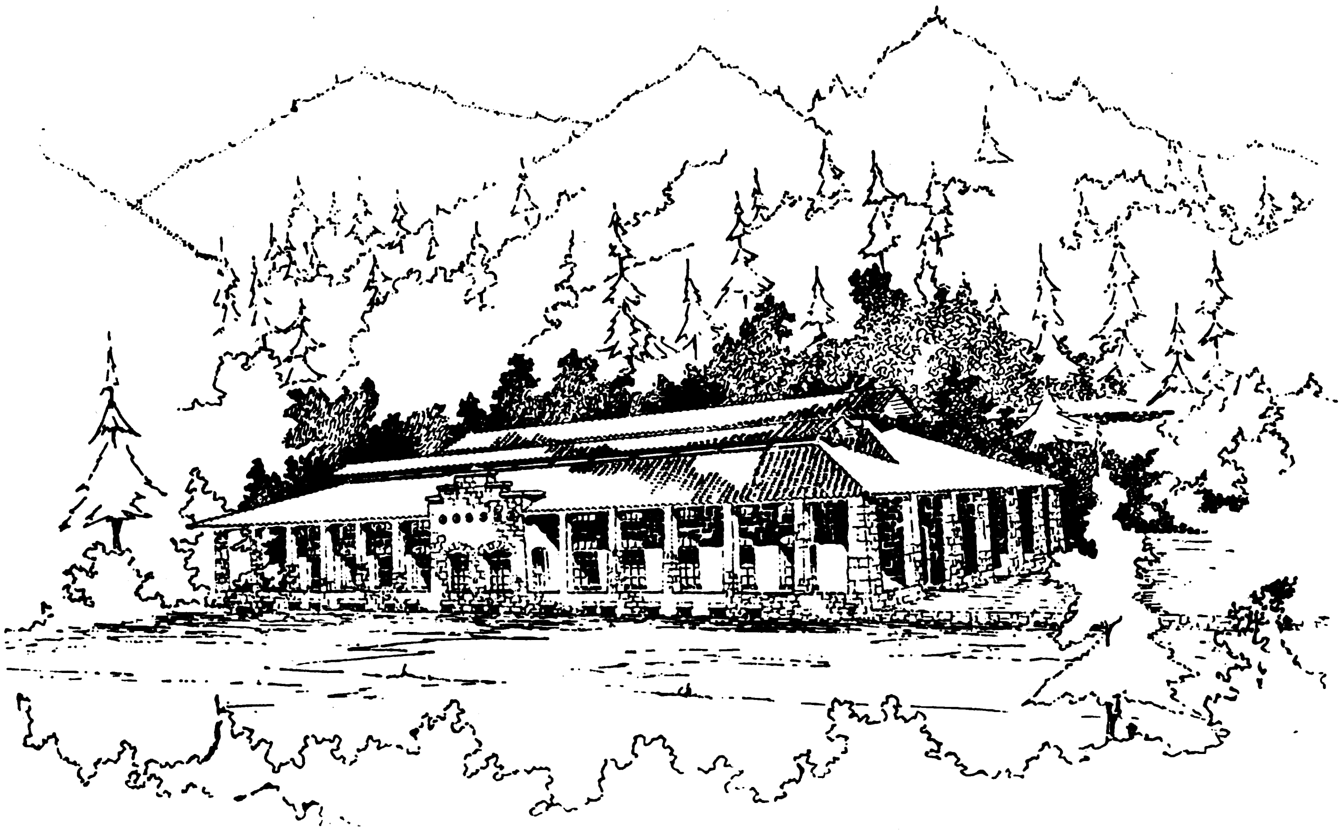
SINGAPORE-KRANJI RAILWAY:—The earnings of the Singapore-Kranji Railway during April amounted to $16,883.55 against $22,115.72 for the corresponding period of last year. The total receipts for the first four months of the year compare unfavourably with that obtained during a similar period of the previous year.

THE FAT SHAN RAILWAY:—The section of the Yuet Han Railway, from Canton to Fatshan, seems to have deteriorated from bad to worse since it was handed back by the Americans to China. Some of the railway stations along the line are built of bamboo, and are the resort of gamblers and opium smokers.

MANCHURIAN RAILWAYS:—Over sixty-four miles of the Chinese Eastern Railway between Changtu and Kungchulin were delivered to the Japanese Commission, headed by Major-General Nakamura, on the 1st of June.

INDIAN RAILWAY PURCHASE:—Final arrangements for the Kalka-Simla Railway purchase by the Government of India for £300,000 are now being made by the Secretary of State.

JHELUM RIVER HYDRO-ELECTRIC POWER INSTALLATION IN BRITISH INDIA



PROPOSED GENERATING STATION FOR THE JHELUM RIVER POWER TRANSMISSION SCHEME.

The government of British India has for some time pursued a broad-minded policy in developing the latent possibilities of the immense and valuable country over which it exercises sovereignty, and its officials have interested themselves in providing for the future welfare and enlightenment of the native inhabitants. Among other laudable projects, which the Government has instituted, has been the commissioning of some of the most capable Royal Engineers to plan for and construct public works, such as would aid in the general advancement of the native industries and the development of the commerce of the country.

The first notable project undertaken for the generation and distribution of electricity was that of the Cauvery Power Scheme, located in Mysore State in Southern India. Work on this plant was started in 1900, the initial installation being completed after many difficulties in June 1902. About a year ago, the second installation or extension of the plant, consisting of 3610 kilowatts generator capacity, was completed. This increased the possible output of the entire plant to 7920 kw, making it the largest hydroelectric installation now operating in Southern Asia, if not on the entire continent.

The chief credit for the completion of the Cauvery Power Plant is due to Major A. J. de Lotbiniere, R. E., Deputy Chief Engineer of the Government of Mysore, who not only conceived the plan of the installation, but successfully arranged for the financing of the entire project, overcoming prejudices that would have deterred a man less sound in his convictions. He afterwards arranged for the purchase of the entire electrical and hydraulic equipment and supervised its installation.

The power scheme next to be undertaken after the Cauvery is the Jhelum Power Installation on the Jhelum River in Kashmir, in Northwest India. This power plant is to be installed near Rampur about 50 miles below Srinager, where a 6-mile conduit will give a head of water at the plant of about 400 feet. The present plans call for an installation of about 20,000 horsepower.

It is planned to use the power for operating the Kashmir section of the Jhelum Valley Railway electrically along its entire length of 180 miles. A single-phase system of traction will undoubtedly be installed. Possibly the most important immediate use to which the power will be put will be in operating dredgers for the purpose of deepening the Jhelum River in the Kashmir Valley, and thus minimizing the floods, which, under existing circumstances, periodically devastate the entire country. The contemplated plant will also allow of the reclamation of a very large tract of land, and permit of the storage of water in Wular Lake above the power plant for sale to the Punjab Irrigation Department. Another important use of the power will be for operating the large silk factory at Srinager and also for supplying with current the electrical water heaters in the silk mill. In addition, the power will be utilized for other industrial purposes and for lighting in Srinager and in Abbottabad, Murree and Rawalpindi, prosperous towns in the British Province of Hazara, lying to the west of Kashmir.

After successfully completing the preliminary arrangement for carrying on the important work connected with the Jhelum Power Installation, Major de Lotbiniere was instructed last May, by the Jammu and Kashmir State Council, acting for the Maharajah of Jammu and Kashmir, to proceed to Europe and America in order to interview the leading hydraulic and electrical manufacturers and to ask those selected to bid upon the machinery and materials for the plant. Carrying out these instructions, he visited the works of those leading manufacturers on both continents who were considered for the work and personally inspected their manufacturing establishments, as well as power plants in which their machinery was operating.

As a result of this careful investigation, Major de Lotbiniere, who had full powers for the acceptance of the tenders submitted, has recommended to his Government that the contracts for the entire hydraulic and electrical equipment be placed with firms in the United States. The contract for the hydraulic equipment was awarded to the Abner Doble Company of San Francisco, U. S. A., and calls for the hydraulic plant complete from the forebay to the tailrace, including the intake, valves, pressure pipes, pressure-pipe thrust blocks, interior piping, water wheels and nozzles, hydraulic governors, and all details necessary for the hydraulic equipment. The apparatus and materials are to be delivered at the port of Karachi, India.

The gravity conduit line for the power plant will be approximately 34,000 feet in length and for the upper 8500 feet will consist of an excavated ditch lined with masonry. The remaining portion of the water channel will consist of a rectangular flume, or a wooden stave pipe such as has been installed so successfully in connection with plants of this character on the Pacific Coast. The flume will have a capacity of over 500 cubic feet per second.

The forebay at the end of the gravity line and at the head of the pressure pipes will be constructed of masonry and will be provided with special headgates. The sliding elements of the intake gates will be of timber, all iron and metal parts necessary for the construction of the gates being furnished by the hydraulic contractor.

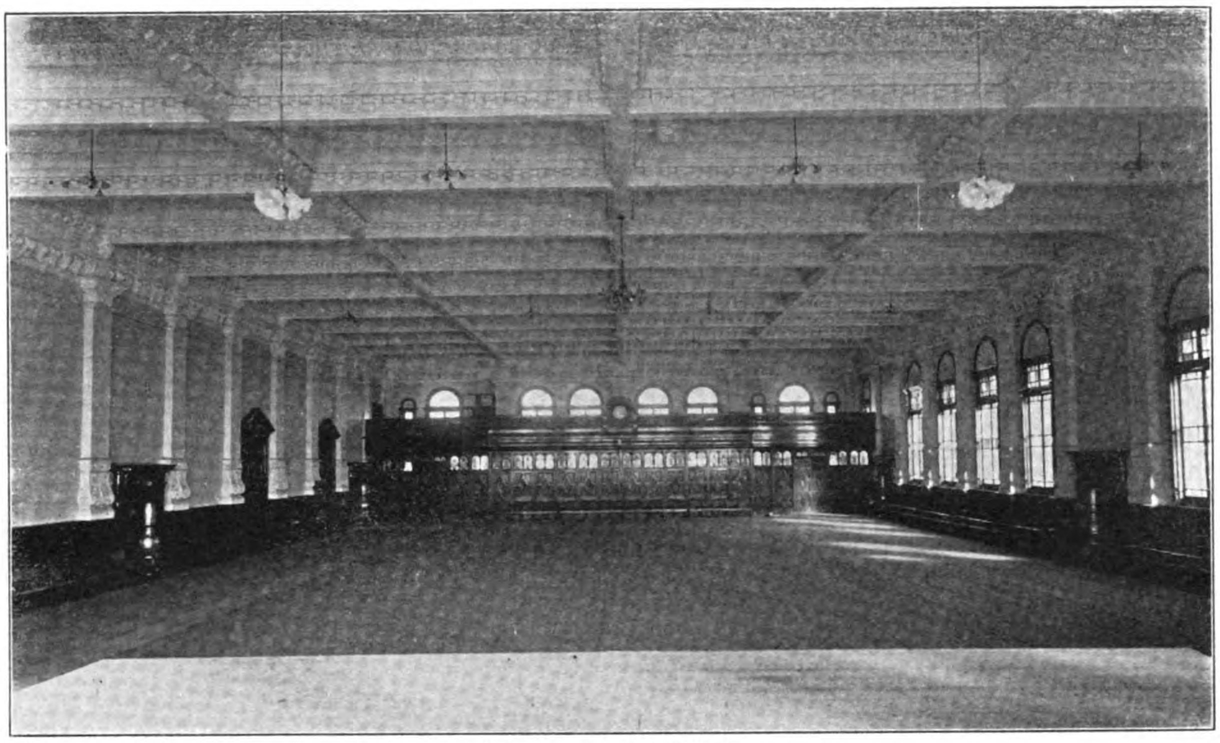
The pressure lines will consist of riveted steel pipes designed with a factor of safety of five, each supplying one of the hydro-electric units. For each pipe line a standpipe and two special vacuum valves will be provided in order to protect the pipe against injury in case the water should be drawn out suddenly.

At the lower end of each pressure line the last length of pipe will terminate in a flange which will be bolted to a massive cast-iron thrust block that will rest on a heavy cast-iron sole plate or base. The latter will be mounted on a substantial masonry foundation and held in position by anchor bolts. This fitting will be designed to take the entire hydraulic thrust of the pipe, an ample factor of safety being allowed so that under the most severe conditions there will be no strain on the branch piping in the interior of the power house. Each pressure line will consist of a riveted steel pipe varying in diameter from 30 to 36 inches and a 54 to 56-inch taper

(Continued on page 68.)

SHANGHAI MUNICIPAL PUBLIC WORKS

Extracts from Report of C. Mayne, C. E., Municipal Engineer and Surveyor



TOWN HALL (160′×80′)

I beg to submit my seventeenth Annual Report for the year ended 31st December 1905.

During my absence on leave from June 12th to December 4th the Assistant Engineer, Mr. C. H. Godfrey, was in charge of the Department.

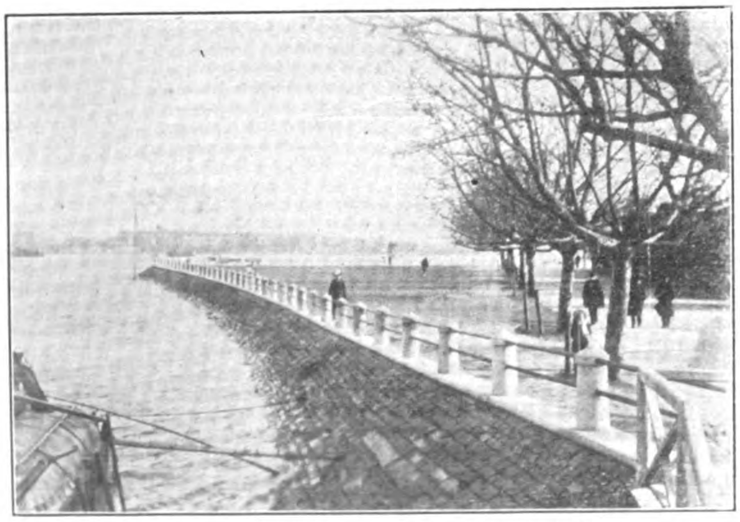
The total Expenditure authorized in the Budget for new and maintenance works was Tls. 762,493, and the actual expenditure has amounted to Tls. 713,410, as against Tls. 817,287 in 1904 and Tls. 1,093,464 in 1903.

The most important works completed during the year were the Sinza Police Station, Public Garden Reclamation, Markham Road Bridge (cost defrayed by private individuals), the erection of a coffered ceiling in the large room of the Town Hall (160′ 0″ x 80′ 0″), the widening of the Bund from the Public Gardens and the putting through of Ward Road 50 feet wide from Alcock Road to the Yangtszepoo Creek, a distance of over 1¼ miles. The land for a new road (to be known as Edinburgh Road) from Siccawei to Jessfield has also been acquired.

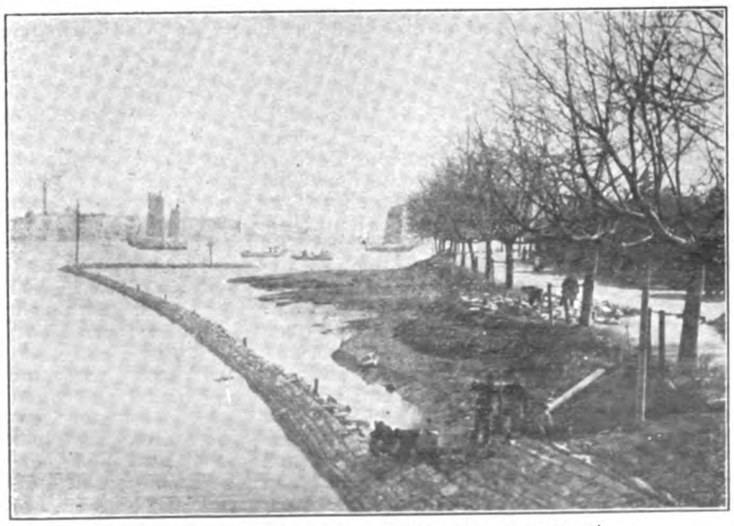
One of the greatest improvements which has been carried out in Shanghai for some years is the reclamation on the north of the Public Gardens, whereby 5½ mow of land has been added to the grounds, which have latterly proved too small for the crowds which assemble there on band nights. The whole of the work was done departmentally at a cost of Tls. 11,300, just less than half the price submitted by the lowest contractor. The whole of the mud for raising (about 40,000 tons) was taken from the Soochow Creek, and the navigable channel has been very much improved thereby. It is satisfactory to note that although the work was only just completed when the typhoon and heavy floods of the 1st of September came, it did not sustain the slightest damage.

After several months' delay it has now been decided to call for tenders for a new Garden Bridge, sixty feet wide, having one clear span of 165 feet over the fairway on the south side and three smaller spans on the Hongkew side. Tenders are also to be invited for a new steel bridge over the Soochow Creek at Chekiang Road. This will be 40 feet wide with a span of 192 feet. Provision is also made in the Budget for the erection of a new steel bridge at Kiangse Road.

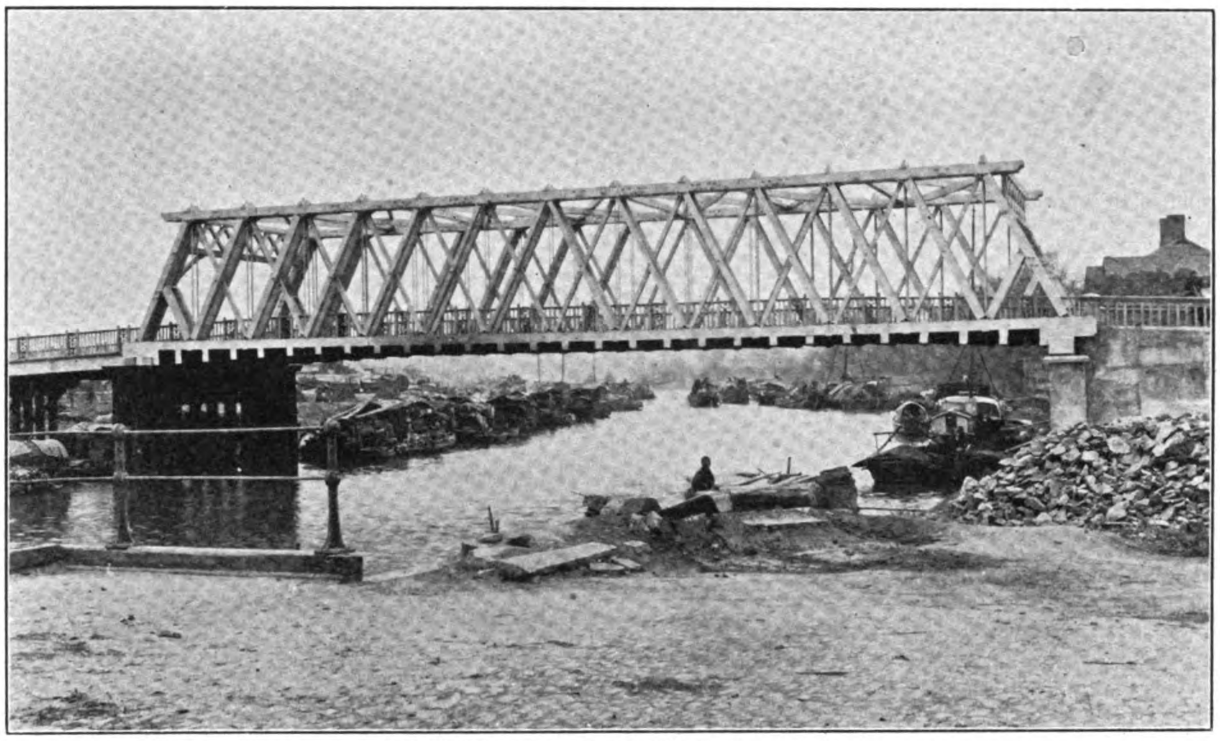
In order to supply intending contractors with as reliable information as possible with regard to the foundation on which the abutments of these bridges will have to rest, it was decided to sink trial holes to ascertain the nature of the strata. Holes 3½″ diameter were accordingly put down on the sites of the various bridges, four to a depth of 200 feet and three to 100 feet. The result, as was anticipated, showed that no firm foundation could be relied upon and that any structure to be erected must rest on a bed of alluvial deposit of a treacherous nature. Mr. T. W. Kingsmill, an authority on such matters, describes the soil as "a water-logged, highly micaceous sand of extreme fineness and of alluvial deposit and generally under pressure with no more consistency than a quicksand."



PUBLIC GARDEN RECLAMATION (Completed)



PUBLIC GARDEN RECLAMATION (In Progress)



MARKHAM ROAD BRIDGE (Main Span 104')

The samples obtained from various depths at each boring have been preserved.

BRIDGES.—The total number of bridges in charge of the Department is 68 (including those over the Hongkew Creek and Saw Gin Kiang erected by the Land Investment Company).

A new wooden truss bridge has been constructed across the Soochow Creek at Markham Road. The main span is 105 feet, and the width 25 feet. The abutment on the south side is of cement concrete below low water level.

Two hardwood bridges have been erected by the Land Investment Company, one across the Hongkew Creek and the other across the Saw Gin Kiang. The Council has arranged to pay one-third of the cost of these bridges.

A new hardwood bridge 100 ft. in length and 30 feet wide has been constructed across the Hongkew Creek at Scott Road.

Considerable repairs have been made to the Garden Bridge, nearly the whole of the decking having been renewed. Many of the piles and other portions of timber are becoming very much worn.

Extensive repairs have also been carried out to the Honan, Shanse, Chekiang, Clatter and Stone Bridges.

BUILDINGS.—*Sinza Police Station.*—This station has been erected on a site fronting the Avenue Road and comprises the following buildings:—Main block for foreigners, Indians' quarters, native quarters, stabling and prisoners' cells.

The buildings are of grey brick with red brick dressings and a sparing use of green Ningpo stone. Roofs are of corrugated iron.

No boundary walls have as yet been erected owing to the Council's intention of building a new Fire Station on that part of the site directly fronting Avenue Road.

The cost of the building, exclusive of road-making, etc., has been Taels 40,000.

Town Hall.—In response to the crying need for bettering the acoustic properties of the large Assembly Room, a new coffered plaster ceiling has been successfully erected at the level of the old tie-beams, thereby obliterating the view of the unsightly roof-trusses and greatly improving the room in every way. By way of counteracting any misgivings as to the suitability of the old roof-beams to carry the heavy extra weight imposed (not less than 80 tons over all), one of the trusses was carefully tested by suspending a platform loaded gradually with bricks until a maximum weight of 7 tons was equally distributed along the tie-beam without any deflexion whatever taking place. The whole work was smartly carried out by contract and was completed in 8 weeks in readiness for the St. George's Ball, being four weeks before the date stipulated in the agreement, the total cost being Taels 6,000. A detachable and removable raised platform 24' × 26' and 4' high has been provided for the use of the Band consisting of sixteen skeleton tables of such a size as to pack away one inside another when not in use. The front is of panelled work and the platform may be erected in whole or part as occasion requires. The cost was Taels 510.

Carter Road Police Station.—The old Bungalow and adjoining Indians' quarters have been generally remodelled and renovated, the cost including repainting and electric light and bells was Taels 1,400.

BUNDINGS.—*Soochow Creek.*—A section of concrete bunding between North Fokien and North Chekiang Road Bridges is now in course of construction. Another section between Woosung and Chapoo Roads is also nearing completion. With the completion of the present work there will be a continuous concrete bunding from Thibet to Fokien Roads on both sides of the Soochow Creek.

Lay Road.—Owing to the continual scour of the bed of Yangtszepoo Creek in the vicinity of Yangtszepoo Bridge and to the force of the current during the typhoon last September a portion of the bunding in Lay Road immediately north of the Bridge subsided; this has now been remedied by the construction of a new hardwood bunding of larger dimensions than the old. This bunding has been erected to the scheduled line of Lay Road.

The typhoon was also responsible for washing away a portion of the embankment and road at the Point. This has now been repaired. A bamboo bunding together with four bamboo groynes has been constructed with a view to encouraging the deposit mud at this point, in order to give more protection to the existing bank.

Bund Foreshore.—The whole of the Bund foreshore is being protected with a stone slope, a portion between Peking Road and the P. & O. jetty and another portion between Kiukiang Road and Hankow Road being completed; the whole section from Peking to Hankow Road will be finished in about six weeks.

Hongkew Creek.—The wooden bundings on the Hongkew Creek between the River and Yuhang Road have been repaired and new piles put in where necessary.

North Yangtsze Road.—The North Yangtsze Road wooden bunding has been repaired and renewed for a length of about 300 feet.

Yangkingpang.—The bundings on the Yangkingpang and Defence Creek have received attention during the year, although no extensive repairs have been made.

CREEKS AND RIVER.—*Soochow Creek* has been dredged in front of the Thibet and Kansuh Road Garbage chutes, and 3,484 tons of mud removed. This creek was also dredged near the Fokien Road Bridge for the Health Department, 3,425 tons of mud being removed.

Hongkew Creek in front of the Seward Road Garbage chute has been dredged and 1,258 tons of mud removed.

Defence Creek.—12,950 tons of mud and refuse was removed from Defence Creek during the year at a cost of Tls. 0.15 per ton. The work was done by means of small boats, each carrying about 6 tons, which were loaded at low water and moved off, with their loads, when the tide rose high enough to float them.

The cost of collection and removal of garbage from the streets and barging it away, averages about Tls. 0.37 per ton. The cost of removing mud and refuse from a navigable creek is therefore less than half the cost of collection and removal of refuse from the streets. The silting of Creeks such as Defence Creek, Yangkingpang and Hongkew Creek, is chiefly due to the depositing of garbage therein by the natives, a practice almost impossible to stop, but which need not cause anxiety seeing that the silting can be remedied so cheaply.

PINGCHIAO QUARRY.—*Quarrying.*—2,140 tons of good rock have been quarried from the small hill and 30,263 tons of good stone and 617 tons of rotten stone have been blasted from the large hill, in addition to 4,623 tons of decomposed sand. The rotten stone has been taken to the refuse heap. The handling and getting out of decomposed sand is becoming more and more expensive as we advance up the hill and I think in the near future it will be necessary to obtain a new sand quarry elsewhere. A great deal of stripping has been done, the earth being used for raising the quarry floor, which is now on a level with the "Gates" Crusher platform. The quarry is now in a position to turn out large quantities of material.

JHELUM RIVER HYDRO-ELECTRIC POWER INSTALLATION

(Continued from page 65.)

pipe, 10 feet long, at the upper end. The pipes will be 790 feet in length and will deliver the water under an effective head of 400 feet.

The interior piping of the power house will consist of welded pipe with welded flanges, all piping and fittings beyond the thrust block being designed with a factor of safety of 10 and subjected to a test pressure of 1½ times the working pressure for a period of five hours.

Twelve main units and three exciter units have been planned for the equipment of the power house. Each main unit will consist of a Doble Tangential Water Wheel with automatic oil-pressure governor delivering 1765 brake horsepower to the shaft, under an effective head of 400 feet. Each wheel will be direct connected to a 1000-Kw alternator, the speed of the unit being 500 revolutions per minute. The exciter units will each consist of a Doble Tangential Water Wheel delivering 285 brake horsepower to the shaft under an effective head of 400 feet. The speed of the exciters will also be 500 revolutions per minute.

The hydro-electric units will be of the Doble standard two-bearing type, the wheel runner being fastened on the end of the shaft. For each of the main units the Doble Company will furnish a high carbon, open-hearth steel forged shaft and two bearings of a special ring-oiling type provided with revolvable bearing shells. The exciter water-wheel runners will be mounted on the extended ends of the exciter generator shafts.

The water wheels will be equipped with ellipsoidal buckets, needle regulating nozzles and centrifugal water guards. The regulation of the main units will be effected by means of hydraulic governors operating jet deflectors. For the exciter units hand regulation will be provided by means of the needle nozzles. The gate valves for each wheel will be of special construction with outside screw and yoke, bronze-mounted, with by-pass.

The power house will be of solid masonry construction and will have a wide veranda as a protection from the tropical sun. A double steel roof will be provided and two travelling cranes will be installed for handling the machinery. The transformers will be installed in a bay of the main building or in a separate structure.

The conditions under which the plant will be installed are decidedly out of the ordinary as compared with similar work in this country. The specifications for the electrical and hydraulic equipment stipulated that no single piece of machinery should weigh more than four tons when packed, for the reason that there is 200 miles of road transportation, including a lift over a range of mountains 8000 feet high. Transportation in that section of the country is limited to bullock cart, and no single piece of machinery heavier than 4 tons can be transported, a total of 5 tons including the trollie (cart) being the maximum weight that can be hauled over the mountains.

Portland cement costs $7.50 per barrel delivered at the site, making its use prohibitive for heavy concrete work. However, there is plenty of natural rock in the vicinity, so masonry construction will be used for the walls of the power house and for the foundations of machines, intake, forebay, etc.

The entire hydro-electric installation will be constructed, erected, tested and placed in operation under the supervision of Major A. J. de Lotbiniere, R. E. Major D. Fraser, R. E., and Capt. Thomson, R. E., will act as his engineering representatives in London. Mr. A. C. Jewett; formerly of the General Electric Company, will serve as installing engineer for the Government. Mr. Jewett was connected with the installation of the Cauvery plant and his selection as erecting engineer for the Jhelum River installation comes as a well-deserved recognition of his ability.

LE PARISIEN CARRIAGE FACTORY, MANILA

LE PARISIEN CARRIAGE FACTORY.

The large and well equipped carriage factory, "La Parisien," situated at 340 Calle Palacio, Walled City, is one of the finest factories of its kind in the Far East. Mr. Blanco, the proprietor, has had many yecrs' experience in carriage building, constructed of native wood, and has found that "narra" and "banuyo," after having been duly seasoned by air drying for two years, bring the best results for carriage and carromata construction.

The factory uses the famous English spring (scroll elliptic) exclusively on all carriages making a very easy riding vehicle. The wheels used are from the best American manufacturers, and the tires Goodyear's "Diamond" brand. Other tires used are the large and 1½ inch rubber, with special tires, made by Michelen & Co. of Paris. Only the best of leathers are used—such as "Deep Buffed Enamel," "Enamel Split" and "Morrocolene for dashes."

One may be assured, after going through the factory, that durable rigs will certainly be turned out—the care that is taken in placing each part together to make the finished vehicle. Another proof of the durability of the Blanco carriage or carromata is the fact that the factory is patronized, not only by the old timers, but by the principal livery stables, such as the Waldorf, Club, Pedro's and others. This bears out the facts which the Factory guarantee, that their work is the best and their prices the lowest. Mr. Blanco has a fine line of rigs in stock and request the public to visit his show rooms which are situated at the factory, 340 Palacio, Walled City.

MINING

INDIA MINING RETURNS.—The following are the output of Gold during the month of May last:—

Balaghat.—4,450 tons of Quartz crushed yielded 3,542 oz. and 4,003 tons of Tailings cyanided yielded 397 oz, making a total of 3,938 oz. of Gold.

Champion Reef.—Milled 14,986 tons which produced 11,161 oz. and 17,340 tons of Tailings treated by the Cyanide Process produced 2,497 oz, making a total production of 13,658 oz of Gold.

Hutti (Nizam's).—931 oz. of Gold from 2,150 tons of Quartz crushed and 279 oz. from 2,050 tons Tailings cyanided, making a total yield of 1,210 oz. of Gold, estimated value Rs. 69,000.

Mysore—14,450 tons of Quartz crushed produced 14,705 oz. Steamings from plates 807 oz. and 13,500 tons of Tailings cyanided yielded 1,766 oz., making a total production of 17,278 oz. of Gold.

Mysore West.—Mill ran 662 hours, crushed 2,160 tons and yielded 687 oz. Bar Gold, and 2,496 tons of Tailings treated by the Cyanide Process yielded 110 oz. of Standard Gold

Nundydroog.—6,750 tons of Quartz crushed yielded 5,278 oz. 7,290 tons of Tailings cyanided yielded 753 oz., making a total yield of 6,031 oz. of Gold.

Ooregum.—Stuff crushed 10,172 tons, Gold produced 4,685 oz. and Slimes and Tailings cyanided 10,098 tons, Gold produced 917 oz. making a total return of Gold 5,602 oz.

FUSHUN COAL MINE.—The Nichi Nichi Shimbun and other journals have an interesting note on the Fushun coal mine. We (Japan Mail) read that the seam of coal is from 100 to 120 feet thick, and that it extends to a width of 10 miles. Experts say that there is no such deposit of coal known to exist elsewhere in the world. It would be easy to obtain seven or eight thousand tons daily, when the new American machinery is adopted, but the Japanese Government does not desire to inaugurate any keen competition with the home mineral, and consequently the production will be limited to some 3,000 tons, varying, of course, according to demand. The coal, it is estimated, can be taken from the mine at a cost of 1.20 yen per ton. The expense of carriage to Dalny (270 miles is now 2 sen per mile, but it will be reduced to one sen. The cost of handling is calculated at 1.50 yen, and the freight to Shanghai will represent 3.50 yen. Thus the mineral can be laid down at Shanghai for 8.90 yen. What price will there be asked for it the Tokio papers do not say, but if it be sold at 10 yen, and if 10 sen be allowed for commission and expenses, the net gain to the owners of the mine would be 3000 yen daily or 1,095,000 yen yearly. That is not a very striking figure.

NEGRI SEMBILAN TIN.—The output in April was 6,190.14 piculs against 5,677.17 piculs in the month before.

The approximate value of the metal, reckons the "Perak Pioneer" was $533,404.36 on which duty amounting to $73,780.30 was collected.

Comparative return for the first four months of 1905 and 1906:—

		Output Piculs	Duty $
4 months	1905	27,006.39	286,124.29
,,	1906	25,195.65	289,305.25
A decrease of		1,810.74	
An increase of		......	3,180.96

The budget having estimated $288,666.66 as the revenue for four months of the year, the excess over those figures is only $638 59.

MALACCA.—Tin mining, insignificant in Malacca during the last half century, showed signs of improvement. Royalty at 10 per cent brought in $2,700, more than double that of 1904. Mr. R. N. Bland proposes to recast the mining regulations which at present are very inadequate A syndicate has been at work dredging for tin on the sea bed at the mouth of the Linggi River. The return of tin so raised in 1905, shows only 48 piculs.

THE KELANTAN GOLD DREDGING CO. (No. 1) LTD.—Summary of Gold Won during the Five Months January to May, 1906.

	oz.	dwt.	grs.
January	150	0	11
February	452	2	6
March	402	6	5
April	522	10	9
May	433	9	5
	1,960	10	0

During January dredging operations were hampered by heavy floods. The above returns were obtained by 3 dredges as under. In January one dredge 2 weeks, one dredge 3½ weeks. In February, two dredges 4 weeks, one dredge 1 week. In March, two dredges 3 weeks, 1 dredge 4 weeks. In April, two dredges 4 weeks, one dredge 3 weeks. In May, three dredges 4 weeks each.

THE DUFF DEVELOPMENT CO., LTD.—Summary of gold won by Prospecting Dredge during the months of January, February, March, April, and May, 1906.

	oz.	dwt.	grs.	
January	36	9	3	Small return during January due to flood season.
February	76	12	12	Until 24th February, Dredge was prospecting River bed.
March	279	0	21	
April	113	10	6	In April a breakdown in machinery occasioned a week's stoppage.
May	184	3	0	The gold shown as won in May was recovered during the four weeks ending 26th May.
	689	15	18	

THE KLEDANG TIN MINING CO., LTD., has been registered in London. Capital £100,000 to acquire the mines and undertakings carried on by Foo Choo Choon of Perak and to adopt an agreement with the Hearwood Syndicate. No initial public issue; first directors J. Wickett, S M Abbott, Foo Choo Choon, T. W. Field, H. Rich and C. V. Thomas; qualification 500 shares, remuneration £50 each for first year; £100 each afterwards. Register Office, Station Hill, Redruth, Cornwall.

A Home paper of the 26th ult, says:—Amongst the visitors to Australia. when the last mail left, was Mr. C J Lock, formerly general manager of the Raub Australian Gold Mining Company—situate in the Malay Peninsula—which has been worked chiefly by Queensland capital. Mr Lock is representing, it is stated, two or three London combinations interested in Australian mining, who are anxious to invest in tin-mining properties.

PAHANG GOLD EXPORT.—The Pahang gold export in May was 723 ounces, all from the Raub mine. This makes a total of 4,031 ounces for the first five months of this year, which is but 6 ounces more than five-twelfths of the output in 1905. Last month's output was obtained from 5 807 tons of stone crushed, Bukit Koman having contributed 568 ounces out of 3,499 tons, and Bukit Malacca 155 ounces from 2,308 tons; the average yield is given as 3 23 dwts and 1.34 dwts to the ton, respectively. The April figure is only 11 ounces more than that of March. The Koman average is slightly lower than that of the previous month, while that of Bukit Malacca is higher.

BERSAWAH GOLD MINING CO.—The Manager of the Bersawah Gold Mining Co. reports that crushing at this mine recommenced on the 21st of May. The New Shaft is now completed to a depth of three hundred feet and the result of the preliminary crushing shows 82 ozs 15 dwt of gold for 180 tons of ore crushed; the average working out at 9.19 dwts. per ton.

THE CHINESE ENGINEERING AND MINING CO., LTD.—Total output of the Company's three mines for the week ending 26th May, 1906, amounted to 19,747.38 tons and the sales during the period to 19,108.55 tons.

THE SOCIETE DES MINES D'ETAIN DE KINTA has declared a dividend of f32.50 a share and of f 67 50 for deferred shares for 1905, against f30 and f54 distributed respectively for 1904.

THE MINING LEASES OF THE CHENDERIANG HYDRAULIC TIN MINING CO., LTD., have been forfeited for failure to fulfil conditions of lease.

THE TRONOH MINES.—Output for the month of May was 2,777.51 piculs of undressed tin ore, valued at $130,000.

ELECTRICAL

BANGKOK TRAMWAYS:—The new company which was formed a short time ago for the construction of a steam tramway from Bangkok to Pakret and Ban Mai has obtained its concession. Among the conditions laid down is that the company (the Muang Non Tramway Co., Ltd.) must construct a good carriage road, with bridges in conjunction with the tramway to Ban Mai, beyond Pakret. In consideration of this the Company will be exempted from taxation for a period of eleven years. The work has already been started, the route surveyed, some of the earthwork and filling-in begun, and part of the materials has arrived.

The line and road will run from near Dusit Park Palace, connecting with the line of the Siamese Tramway Company.

The cost of construction of road and tramway together is estimated in the neighbourhood of a million ticals, and the work will take some eighteen months to accomplish. The road will cross something like 30 klongs.

This will be the pioneer road out of Bangkok, and it is to be hoped that it will be the first of many others.

Another concession, it is expected, will shortly be granted for the construction of the long-talked of electric tramway in Bangkok, on the West side of the river. This, as projected, will run from opposite Chakrawat road to the mouth of Klong Bangkok Noi, with a branch off to Talat Plu on Klong Bangkok Yai, connecting with the Tachin Railway at Talat Plu. The route has been surveyed, and it is expected that the concession may be signed shortly, and then the work will at once be put in hand. The Company is to be known as the Thalart Bhloo Tramway Co., Ltd. The proposed site for the power house is on the southern side of Klong Bangkok Yai, between Wat Kanya and Wat Bupparam.

H. R H. Prince Naradhip, Chairman of the Siamese Tramway Co., Ltd., is the moving spirit in both these enterprises.

ELECTRIC PLANT, SINGAPORE:—Complete electric light installation has just been added to s. s. *Sappho* of the Straits Steam Ship Co. Electric fans and lights have been fitted in the saloon and cabins, giving comfort and pleasure to the traveling public, who will no doubt appreciate this great improvement. The whole installation has been supplied and fitted on board by Messrs. Riley, Hargreaves & Co.'s Electrical Department.

TOKIO TRAMWAYS:—The three electric street-car companies of Tokyo propose to amalgamate. Recently the leading shareholders of the three companies held a meeting respectively and discussed conditions for amalgamation.

WATERWORKS AND IRRIGATION

WATER-WORKS IN SIAM.—We learn that the work of cutting the canal which is to supply the town of Paklat with a wholesome water supply from the Meklong river, has recently been begun, and that a large number of coolies are already employed. A flood gate will be constructed at the entrance of Klong Paklat, and thus the possibility of salt water coming any distance up, will be averted. The inhabitants of Paklat, have been put to very great straits in years gone by through lack of drinkable water during each successive dry season, and it is hoped that this undertaking will supply the long-felt want, with irrigating the vast area of rich and fertile land through which the canal will run from the river Meklong to the Menam.

It is to be ardently hoped that the work of cutting the canal from Chainat, through which Bangkok is to be supplied with a water supply, will also be energetically taken in hand in the near future. In Siam we have no labour problems such as confront other eastern countries, and therefore there is no reason why these vital works should not be pushed ahead, and thousands of valuable lives spared to the kingdom.

KOREAN WATERWORKS:—The prospectus of the Korean Waterworks, Limited, has been issued. The capital is £250,000, in £1 shares, but only 5 per cent debentures, to the amount of £250,000, will be offered to the public at 87½ per cent. The company acquires a concession for 49 years from the date of opening, for the exclusive supply of water to Soul and outlying towns, at present supplied by public wells, usually located at the side of the streets, contaminated by sewage, and undoubtedly the cause of frequent epidemics. The new company will draw its supplies from the Han River on which the capital of Korea is situated, and Messrs. Livesey, Son, and Henderson estimate that, on the basis of 8 gallons of water per head per day, the net revenue will amount to £29,000, or more than twice the amount required for interest and redemption of the debentures.

WATER SUPPLY, KUANTAN F. M. S.:—The town has now a proper water supply, which was provided last year at a cost of $15,000. The water has been brought in from the Galing river at the back of the town, and is distributed by means of standpipes. Raub is the first town in Pahang that got its water-works, an adequate supply having been provided there a few years ago. At Pekan, Temerloh and Lipis, the people obtain their water from rivers and wells.

DREDGING TUNG-TING LAKE, CHINA:—At the request of the British Charge d'Affaires in Peking, the Wei-Wu-Pu has wired the Viceroy and the Governor of Hu-nan with reference to the unsatisfactory state of the Tung-ting Lake which has become so shallow in recent years that navigation from Hankow to Changsha and beyond by steam launches is greatly interfered with. Their Excellencies have been advised to make a thorough investigation of the Lake so that modern steam dredgers may be purchased by them.

SHIMONOSEKI WATER-WORKS:—Trouble is reported from Shimonoseki in connexion with the waterworks. An embankment, presumably of the reservoir, threatens to give way, and its collapse would mean the inundation of numerous habitations. It is said that the responsible engineer is found to have scamped his work and employed means which could not have had more than temporary efficacy.

WHANGPOO CONSERVANCY:—The Agreement between the Chinese Conservancy Commissioners (the Shanghai Taotai and Mr. H E. Hobson) and Mr. de Rijke, as Engineer-in-Chief to carry out the conservancy scheme for the Huangpu, was signed on June 7.

HOWARTH, ERSKINE, LTD., have secured the contract for the Port Trust Wharf at Rangoon. Their tender was in the neighbourhood of £30,000 sterling.

SHIPBUILDING

THE N. Y. K.'S SHIPBUILDING PROGRAMME.—The *Asahi* states that the N. Y. K. steamer *Osumi Maru*, which was launched at the Osaka Ironworks on the 6th inst., will shortly be used on the service between Awomori and Muroran. A steamship which is being built for the Kaisha at the Mitsubishi Dockyard, Nagasaki, to take the place of the ill-fated *Hitachi Maru*, will be launched in November. Three other steamers (each of 3,500 tons), which are being built at the Kawasaki Dockyard, will be launched by March next. A steamer of 2,111 tons and two others of 2,511 each are being built at London. The former will be launched about August next, and the latter by March next year. As previously recorded, the company is likewise making arrangements for the construction of six big steamships, each of 8,589 tons. Of these two will be built at the Mitsubishi Dockyard, and four at the Kawasaki and some other Dockyards.

RILEY, HARGREAVES & CO.'S NEW STEAMER:—Messrs. Riley, Hargreaves and Co., Ltd., launched from their Shipbuilding Yard, Singapore, on the 8th inst., the twin screw tug-boat Kinta, built for the Railway Department of the Federated Malay States. The dimensions are 95′ by 19′ 6″ by 8′ 6″, and the vessel has been built to Lloyd's 100 A.1 Class. The engines, also made by Messrs. Riley, Hargreaves & Co., Ld., are compound surface condensing and together are designed to indicate 400 horse-power. Steam is supplied to the main engines and auxiliary machinery by one large marine multitubular return tube type boiler having two Deighton furnaces. One special feature on board is a Merryweather's fire engine, which has a capacity of 1,100 gallons per minute.

KAWASAKI DOCKYARD CO:—Mr. Matsukata, the President of the Kawasaki Dockyard Co., is said to have stated to an interviewer that the company desires to obtain shipbuilding orders from China, Siam, and all the other oriental countries. With this view it is purchasing about ten thousand tsubo of land at Shanghai and Pootung for the purposes of shipbuilding and repairing, with especial relation to the shipping at Shanghai and on the Yangtsze. At first only repairs will be undertaken there, and eventually a dockyard on a large scale will be developed. Extensions of the Company's property are also in progress at Kobe, in consequence of the increasing size of the vessels constructed in the dockyard there.

THE OSAKA IRONWORKS:—The Osaka Ironworks have large orders for water-pipes from the Sasebo and Maizuru Port Admiralties, the Kwangtung Administrative Bureau, the Imperial Iron Foundry, and the Electric Railway in Korea. Most of the orders are to be executed by next month or July. The Ironworks are now building three steamers, each about 700 tons, for the Osaka Shosen Kaisha, and a destroyer of the same type as the "Asatsuyu," lately launched.

The Nippon Yusen Kaisha announce that they will put three extra passenger steamers viz:—"Satsuma Maru" "Tairen Maru" and "Tategami Maru" on their Shanghai-Yokohama Line, in addition to their regular Mail steamers "Kasuga Maru," "Hakuai Maru" and "Kosai Maru" thus to maintain regular service of twice a week. They will also run "Fushiki Maru" and "Niigata Maru" from Kobe to Hankow via Shanghai.

NEW CABLE STEAMER:—The cable steamer Petrel, built by Messrs. Swan, Hunter and Wigham Richardson, Ltd., to the order of the Eastern Extension, Australasian and China Telegraph Company, Ltd., has been completed. The principal dimensions of the vessel are 357 ft. by 44 ft. by 21 ft., engine cylinders 53in., 39in., and 61in. diameter by 42in. stroke, with four large boilers.

DUTCH STEAMSHIP LINE:—A combination of two Dutch companies is to start a line of steamers from Calcutta, calling at Rangoon, thence proceeding to Penang (should inducement offer), to Deli, and on to Batavia and Sourabaya. This enterprise will provide for the bulk of the India-Java trade.

KAWASAKI DOCKYARD, KOBE:—On the morning of June 11th the Chinese gun-boat *Chu Tung* was successfully launched. This is the second of six sister-ships of the *Chu Tai* class, which latter vessel was launched about June 1st. These vessels are 200 feet long, with a displacement of 740 tons and a speed of 13 knots.

NIPPON YUSEN KAISHA'S SIAM LINE:—The N. Y. K. has determined on running regular liners between Hongkong and Bangkok, of about 2,000 tons, once every fortnight. So far, the carrying trade of Siam has been monopolised by German ships, via Singapore.

NEW STEAMER, TONGKU:—The Company Docks et Appontement du Tongku has recently launched a steamer for local work called the *Perrinette*, which was entirely constructed at the works, and is a credit to her builders.

CHINA BORNEO CO., LD., SADAKAN:—The lighter recently completed by the China-Borneo Co., for their own use, the *Ruby*, started active service on the 20th ult. The place vacated by her in the Company's Works has been taken by a new lighter for the Coal Co., at Tawao. The same yard launched a light-draft launch, also for the Tawao Coal Co., on the 25th ult. It is understood a small lighter, for a local Company, will be started forthwith on the vacant berth. The lighter building at the North Borneo Trading Co.'s works, for the Exploration Co., is also progressing very satisfactorily, and is soon to be ready for launching.

MISCELLANEOUS

LUMBER MILLS, JAPAN.—Some important developments are about to be made with the aid of foreign capital in the timber and glass industries in Japan. A concern has been formed with a capital of $475,000 gold, which will carry on the lumber and sawmill business in Japan, three or four mills being established in different parts of the country. The principal branch of this business will be the export trade, and Canadian engineers will be in charge of the newest and best machinery, to be driven by electricity. The capital is furnished by French, English, and Japanese capitalists, and all the shares are taken by the promoters. The capital of the big glass undertaking is $750,000, furnished by French, Belgian, English, and Japanese capitalists, also taken by the promoters and fully paid up. The factory will be at Osaka. The technical engineers, foremen, and many of the workmen will be French and Belgian. Both syndicates, which are represented in Japan by R. Loonen, had their origin or conception in Paris.

FAR EASTERN SHARE QUOTATIONS

Courtesy of Benjamin, Kelly & Potts, Sharebrokers, Hongkong, July, 1906.

STOCK	WHEN ESTAB-LISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	AT WORKING ACCOUNT	DATE	LAST DIVIDEND	WHEN PAID	Approximate Return at Present Quotation* PER CENT	CLOSING QUOTATIONS
Banks.												
Hongkong and Shanghai Banking Corporation	1865	$10,000,000	80,000	$125	$125	g £1,000,000 s $9,500,000 i $250,000	$1,699,777	31-12-05	£1.15/- div. & £1 bonus @ ex. 2/0-9/16 $26.87 for second half year 1905	26 2-06	5½	$822½ buyers London £92-5- £92-5-/-
National Bank of China, Limited	1891	£699,475	(10) 99,925	£7	£6	c £12,735 $150,000	$74,099	31-12-05	$2 (London 3/6) for 1903	1-2-04	—	$47 cum call
Marine Insurances.												
Canton Insurance Office, Limited	1881	$2,500,000	10,000	$250	$50	$1,600,000 j $147,895	$211,540	31-12-04	$20 for 1904	21-10-05	5¾	$342½
North China Insurance Co., Ld.	1863	£150,000	10,000	£15	£5	g £100,000 s Tls. 100,000 f Tls. 50,000	Tls. 302,053	30-6-05	Interim div. of 7/6 @ ex. 2/10 1/16 =Tls. 2.62. on a/c 1905	1-5-06	5½	Tls. 90 sellers
Union Insurance Society of Canton, Limited	1867	$2,500,000	10,000	$250	$100	s $2,000,000 g £40,000 f $331,131 j $1,153,844 u $569,279	$2,792,271	31-12-05	Interim div. of $30 for 1905	30-4-06	4½	$810 sales & b.
Yangtsze Insurance Association, Ld.	1862	$800,000	8,000	$100	$60	$800,000 j $61,278 f $15,527	$508,334	31-12-05	$12 and $3 special dividend for 1904	19-4-06	8½	$175 sellers
Fire Insurances.												
China Fire Insurance Co., Ld.	1870	$2,000,000	20,000	$100	$20	$1,000,000 x $229,488 f $2,616	$344,098	31-12-05	$6 for 1904	9-3-06	7	$86 buyers
Hongkong Fire Insurance Co., Ld.	1868	$2,000,000	8,000	$250	$50	$1,220,928	$422,618	31-12-05	$25 for 1904	8-3-06	8	$312½
Shipping.												
China and Manila Steamship Co., Ld.	1882	$750,000	(1) 30,000	$25	$25	$6,000	$6,563	31-12-05	$1½ for 1905	15-3-06	7½	$20
Douglas Steamship Co., Ld.	1883	$1,000,000	20,000	$50	$50	$264,638 i $88,941	Nil.	30-6-05	$3½ for year ended 30-6-1905	25-9-05	8¼	$43 buyers
Hongkong, Canton and Macao Steamboat Company, Ld.	1865	$1,200,000	80,000	$15	$15	e $250,000 di $600,000 f $154,331	$24,080	31-12-05	$1 for 2nd half-year mak. $2 for 1905	16-2-06	7½	$27
Indo-China Steam Navigation Company, Ld.	1882	m £600,000	(2) 60,000	£10	£10	£120,000 i £280,958 h £3,999	£2,452	31-12-05	10/- for 1905	Due 7-06	6	$76½ sellers
Shanghai Tug and Lighter Co., Ld. Do. Preference.	1903	Tls. 1,500,000	200,000 100,000	Tls. 50	Tls. 50	i Tls. 40,000	Tls. 23,156	31-12-05	Final of Tls. 3. making Tls. 5 for 1905 Final of Tls. 1¾ making Tls. 3½ for 1905	13-3-06	8 7	Tls. 62 sellers Tls. 51 buyers
"Shell" Transport & Trading Co., Ld.	1898	£2,000,000	2,000,000	£1	£1	£400,000 i £4,144	£107,815	31-12-04	1/- (Coupon No. 6) for 1905	1-1-06	4	27/6 sales
"Star" Ferry Co., Ld.	1898 1900	$200,000	10,000 10,000	$10 $10	$10 $5	$65,000 i $32,957	$218	30-4-06	$1.50 / 75 cents for year ended 30-4-1906	31-5-06	5 3½	$30 $21
Taku Tug & Lighter Co., Ld.	—	Tls. 1,500,000	12) 30,000	Tls. 50	Tls. 50	Tls. 98,000 d Tls. 305,479 e Tls. 48,000 i Tls. 81,200	Tls. 13,913	31-12-05	Final of Tls. 2 making Tls. 4 for 1905	1-3-05	9	Tls. 45 sellers
Refineries												
China Sugar Refining Company, Ld.	1878	$2,000,000	20,000	$100	$100	$850,000 e $450,000 r $86,129	$40,419	31-12-05	Final of $15 making $25 for 1905	22-3-06	16½	$150 sellers
Luzon Sugar Refining Company, Ld.	1882	$700,000	7,000	$100	$100	none	Dr. $132,588	31-12-05	$3 for 1897	24-3-98	—	$20 sellers
Perak Sugar Cultivation Co., Ld.	—	Tls. 350,000	7,000	Tls. 50	Tls. 50	Tls. 100,000	Tls. 3,723	31-7-05	Tls. 2½ for year ending 30-9-1904	20-12-04	—	Tls. 100 sales
Mining.												
Chinese Engineering & Mining Co., Ld.	1901	£1,000,000	1,000,000	£1	£1	d £80,000 h £12,289	£13,355	28-2-05	1/-(No.6) int.d. for 12 m. endg. 28.2.06	1-5-06	7	Tls. 9.80 sellers
Oriental Consolidated Mining Co., Ld.	1901	G. $5,000,000	y 500,000	G. $10	G. $10	none	G. $909,050	30-6-05	Final of 50 cts. mak. G. $1 for 1905	21-12-05	7	G. $14
Raub Australian Gold Mining Co., Ld.	1892	£200,000	150,000 50,000	£1 £1	18/10 £1	£4,873	Dr. £8,745	31-3-05	No. 12 of 1/-=48 cents	28-1-01	—	$3¼ sales

STOCK	WHEN ESTAB-LISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	AT WORKING ACCOUNT	DATE	LAST DIVIDEND	WHEN PAID	Approximate Return at Present Quotation * (PER CENT)	CLOSING QUOTATIONS
Docks, Wharves and Godowns.												
Fenwick (Geo.), & Company, Ld.	1889	$450,000	z 18,000	$25	$25	$70,000	$8,915	31-12-05	$2 on old & $1 on new issue for 1905	12-3-06	9	$22
Hongkong and Kowloon Wharf and Godown Co., Ld.	1886	$2,000,000	40,000	$50	$50	$550,000 d.r. $65,160 i $20,000	$20,040	31-12-05	Final of $3½ making $6 for 1905	15-3-06	5¾	$104 buyers
Hongkong & Whampoa Dock Co., Ld.	1866	$2,500,000	50,000	$50	$50	$49,500	$362,323	31-12-05	$6 for second half year making $12 for 1905	27-2-06	8	$150
New Amoy Dock Co., Ld.	1892	$67,500	10,000	$6¾	$6¾	$88,000	$2,221	31-12-05	$1 for 1905	1-3-06	5½	$18
Shanghai Dock and Engin'g Co., Lt.	1901	T5,520,000	55,200	Tls.100	Tls.100	Tls.1,000,000	Tls.34,924	30-4-05	Interim of Tls. 4 for year 1905-6.	6-1-06	11¼	Tls.107 sales
Shanghai and Hongkew Wharf Co. Lt.	1902	T3,200,000	32,000	Tls.100	Tls.100	b Tls.487,210 r Tls.100,734	Tls.57,065	31-12-05	Final of T8 making T14 for 1905	29-3-06	6¼	Tls.222 sellers
Vulcan Ironworks, Ltd.	1905	T500,000	1,000	Tls.500	Tls.500	—	—	—	First year	—	—	Tls.500 buyers
Yangtsze Wharf and Godown Co., Ld.	1902	T250,000	2,500	Tls.100	Tls.100	Tls.30,000	Tls.5,668	31-12-05	Tls.18 for 1905	31-3-06	8¼	Tls.220 buyers
Lands, Hotels and Building.												
Anglo-French Land Investment Company, Ltd.	1906	T2,500,000	(3) 25,000	Tls.100	Tls.100	—	—	—	First year	—	—	Tls.100
Astor House Hotel Co., Ltd.	1901	$750,000	(4) 30,000	$25	$25	$14,156	$9,028	30-6-05	$2½ for year ending 30-6-1905	20-8-05	8	$31 buyers
Astor House Hotel, Ld. (Tientsin)	—	T100,000	2,000	Tls.50	Tls.50	Tls.35,000 e Tls.10,000	Tls.1,013	28-2-06	Final of Tls.6¼ making Tls.11¼ for year ending 28-2-06	25-4-06	7¼	Tls.147
Central Stores, Ld.	—	$451,845	6,000	$15	$15	—	$4,719	31-12-05	$2.40 on $12 for 1905	13-3-06	13¾	$18 sales
Do. (Founders')	—		123	$15	$12				None	—	—	$300 buyers
Do. (New Issue)	1904		24,000	$15	$15				7 per cent on $7½ for 1905	13-3-06	—	$15¼ buyers
Hongkong Hotel Co., Ld.	1866	$600,000	12,000	$50	$50	$648,975 r $24,071	$619	31-12-05	$5 for 2d half-year making $10, 1905	6-3-05	7¾	$127½
Hongkong Land Investment and Agency Co., Ld.	1889	$5,000,000	50,000	$100	$100	e $250,000	$67,839	31-12-05	Final of $3½ making $7 for 1905	2-2-06	6¼	$113
Hotel des Colonies Co., Ld.	1902	T225,000	9,000	Tls.25	Tls.25	n Tls.29,783	Tls.1,935	31-3-06	Final of 6% making 10% for 1905	31-5-06	16½	Tls.15
Hotel Metropole Company, Limited	1904	$200,000	2,000	$100	$100	none	$4,699	30-6-05	Final of $6 making $10 for the year.	26-7-05	10	$100
Humphreys' Estate & Finance Co., Ld.	1887	$1,500,000	150,000	$10	$10	i $208,386 e $50,000	$5,070	31-12-05	80 cents for 1905	12-2-06	7¼	$11 buyers
Kowloon Land and Building Co., Ld.	1889	$300,000	6,000	$50	$30	none	$574	31-12-05	$2½ for 1905	7-2-06	6½	$38
Shanghai Land Investment Co., Ld.	1888	T2,600,000	52,000	Tls.50	T50	Tls.869,493 e Tls.170,000	Tls.52,194	31-12-05	Final of Tls. 3 making T6 for 1905	23-2-06	5½	Tls.111 buyers
Tientsin Land Investment Co., Ld.	1902	T772,600	7,726	Tls.100	Tls.100	i Tls.71,588	Tls.385	31-12-05	Final of Tls. 5 making Tls. 8 for 1905	24-2-06	7½	Tls.105 sellers
West Point Building Co., Ld.	1889	$625,000	12,500	$50	$50	none	$772	31-12-05	Final of $1.90 making $3.65 for '05	2-2-06	7	$52
Cotton Mills.												
Ewo Cotton Spinning and Weaving Co., Ld.	1895	T1,000,000	(5) 20,000	Tls.50	T50	Tls.45,939	Tls.100,000	31-10-05	T8 for year ended 31-10-1905	18-12-05	11¾	Tls.68 sales
Hongkong Cotton Spinning, Weaving and Dyeing Co., Ld.	1901	$1,250,000	125,000	$10	$10	e $30,000	$23,264	31-7-05	$1 for year ended 31-7-1905	4-9-05	7	$14 sellers
International Cotton Manufacturing Co., Ld.	1895	T750,000	(6) 10,000	Tls.75	Tls.75	Tls.100,000	Tls.18,718	30-9-05	Interim of 3% a/c 1898	30-4-98	—	Tls.61 sellers
Laou-kung-mow Cotton Spinning & Weaving Co., Ld.	1895	T800,000	(7) 8,000	Tls.100	Tls.100	none	Tls.30,760	31-12-05	Tls. 8 for 1905	21-2-06	11¼	Tls.71 buyers
Soey Chee Cotton Spinning Co., Ld.	1895	T1,000,000	2,000	Tls.500	Tls.500	l Tls.18,456	Tls.35,986	31-12-05	Tls. 25 for 1905	7-3-06	8¼	Tls.300 sellers
Miscellaneous.												
Anglo German Brewing Co., Ltd.	1904	$100,000	4,000	$100	$100	none	$1,066	31-12-05	$7 for 1905	1-3-06	7¾	$90 sellers
Bell's Asbestos Eastern Agency, Ld.	1895	£5,377.10s	(11) 8,604	12/6	12/6	£814	£856	31-12-05	1s. 3d for 1905	29-7-05	8¼	$7 ex. div.
Campbell, Moore & Co., Ld.	1886	$12,000	1,200	$10	$10	$9,000	$1,097	31-12-05	$3 for 1905	2-4-06	9¼	$32
China-Borneo Co., Ld.	1903	$720,000	(8) 60,000	$12	$12	none	Nil	31-12-05	$1 for 1904	17-3-05	—	$7½ buyers
China Flour Mill Co., Ld.	—	T200,000	4,000	T50	Tls.50	Tls.50,000	Tls.889	31-12-05	Final of Tls.5 making Tls.10 for 1905	17-3-06	12¾	Tls.79 sellers
China Light and Power Co., Ld.	1901	$500,000	50,000	$10	$10	none	$1,219	28-2-06	60 cents for year ending 28-2-06	9-4-06	6	$10
China Provident Loan and Mortgage Co., Ld.	1898	a $1,000,000	100,000	$10	$10	$100,000	$4,791	31-12-05	80 cents for 1905	22-1-06	9	$9
Dairy Farm Company, Ld.	1896	$187,500	25,000	$7½	$6	$25,000	$2,864	31-7-05	$1.20 for year ending 31-7-1905	24-11-05	7½	$16 buyers

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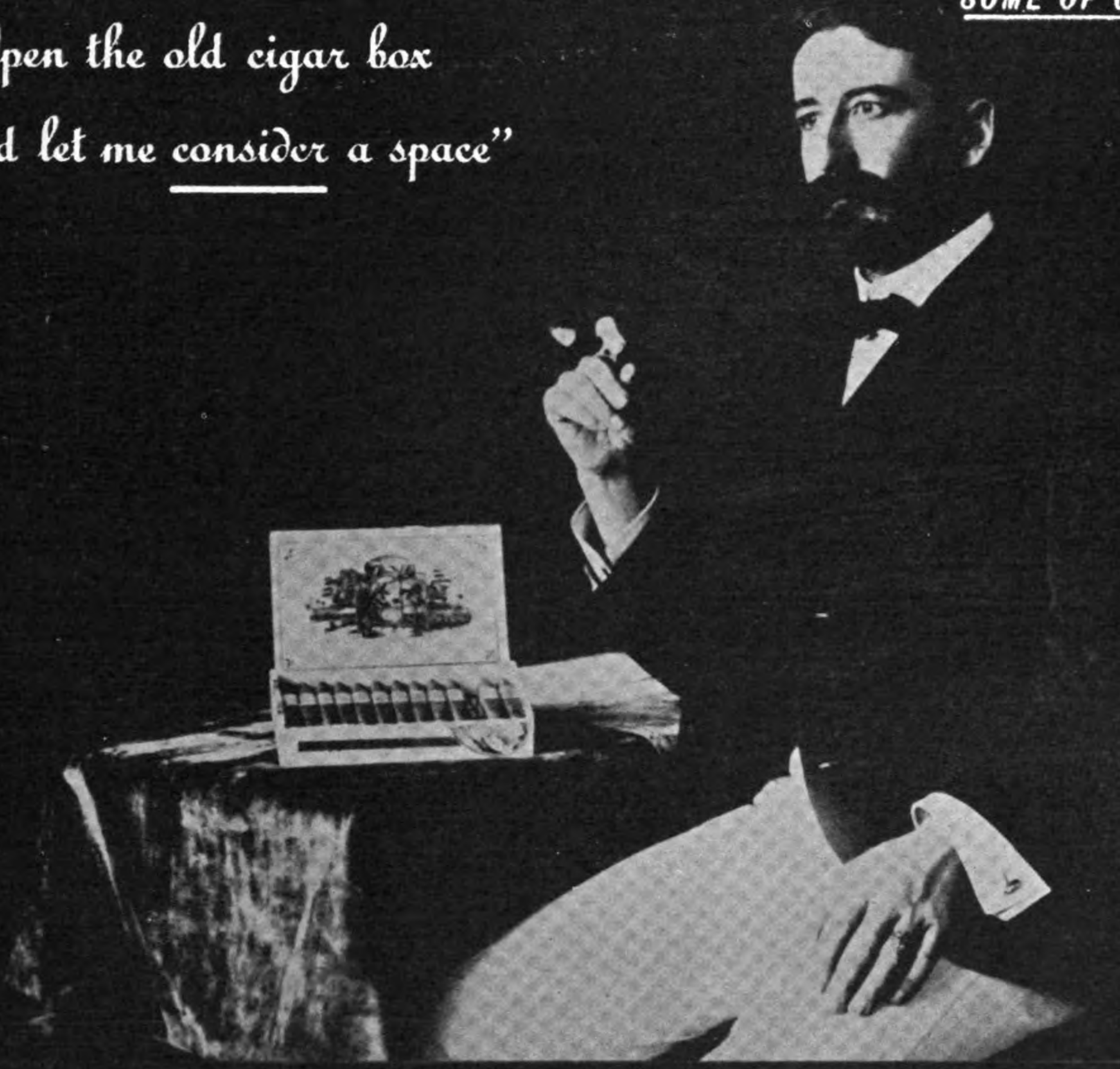

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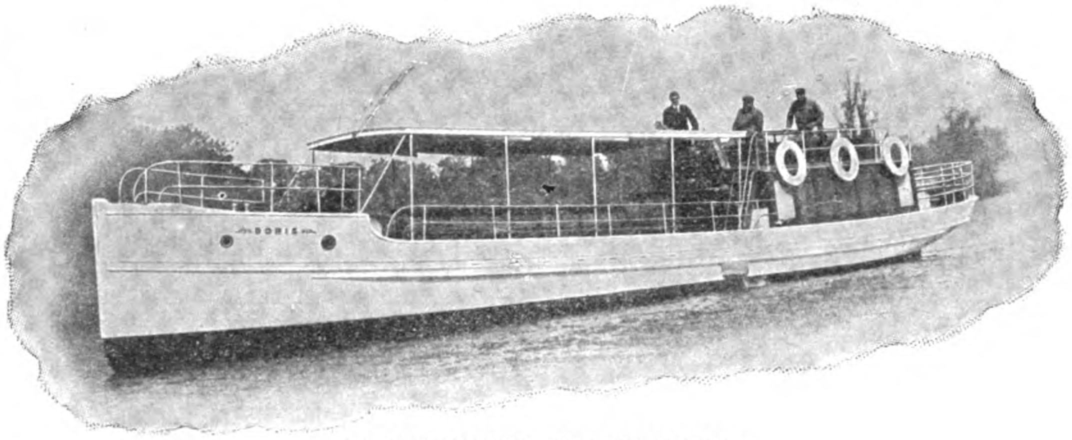

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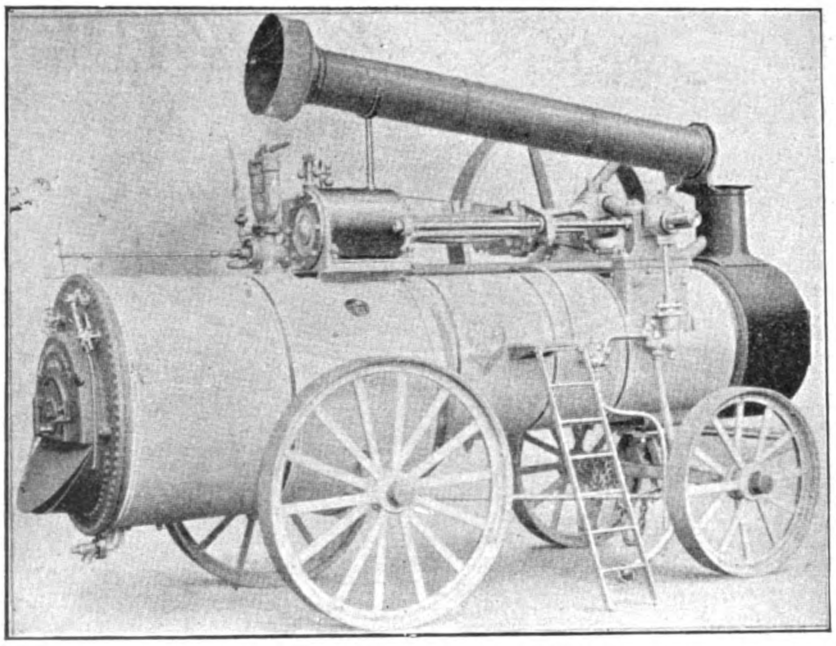

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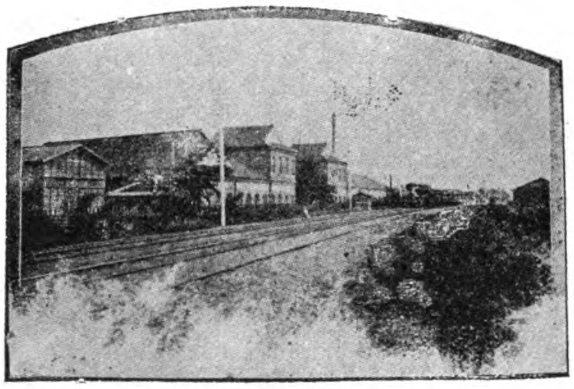

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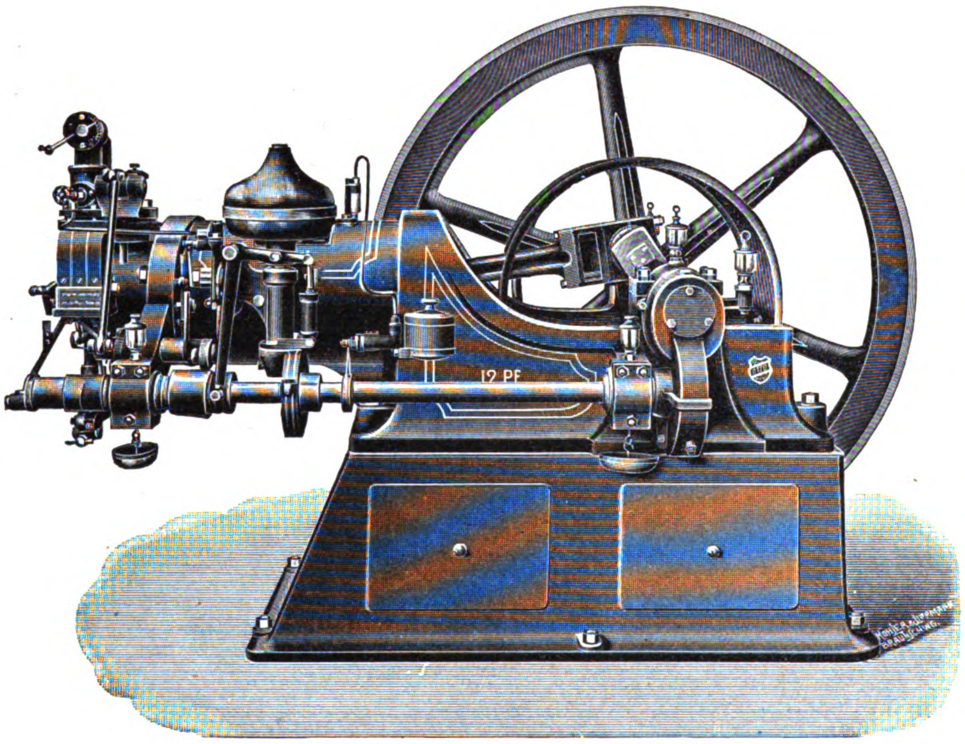

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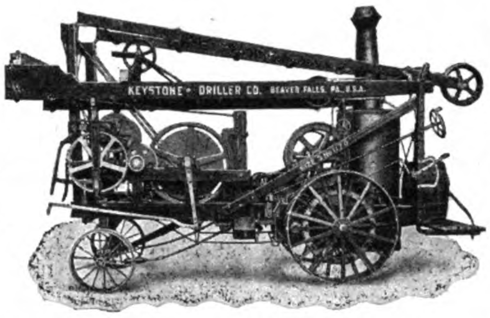

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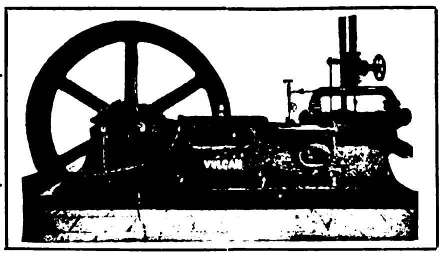

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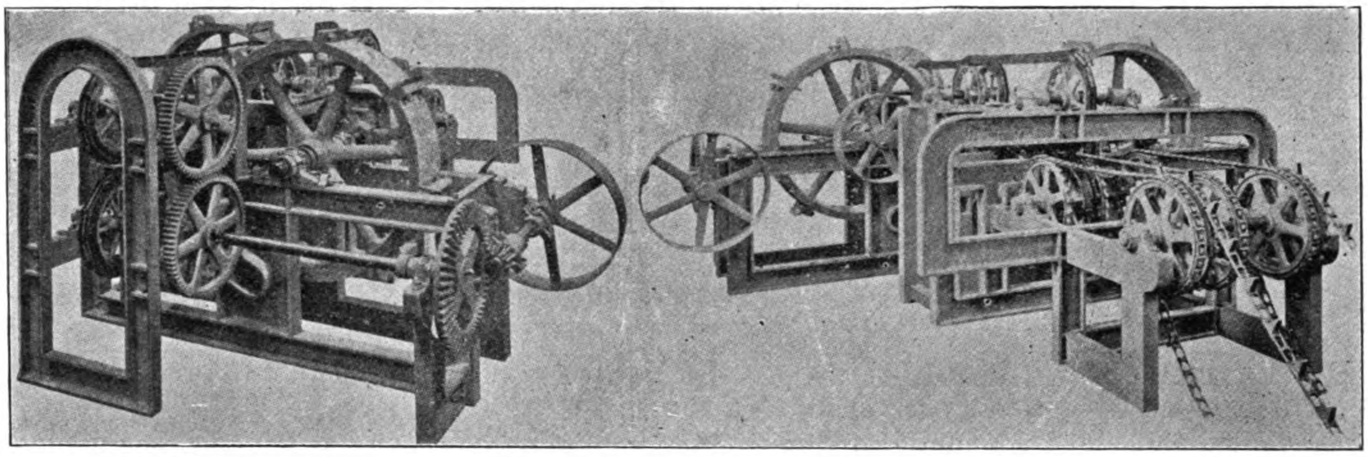

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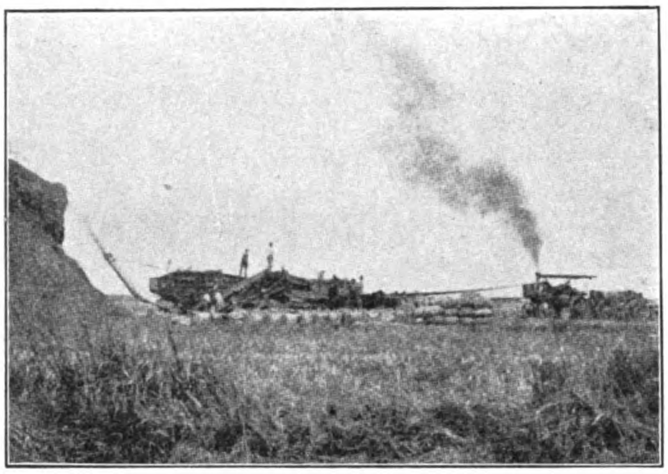

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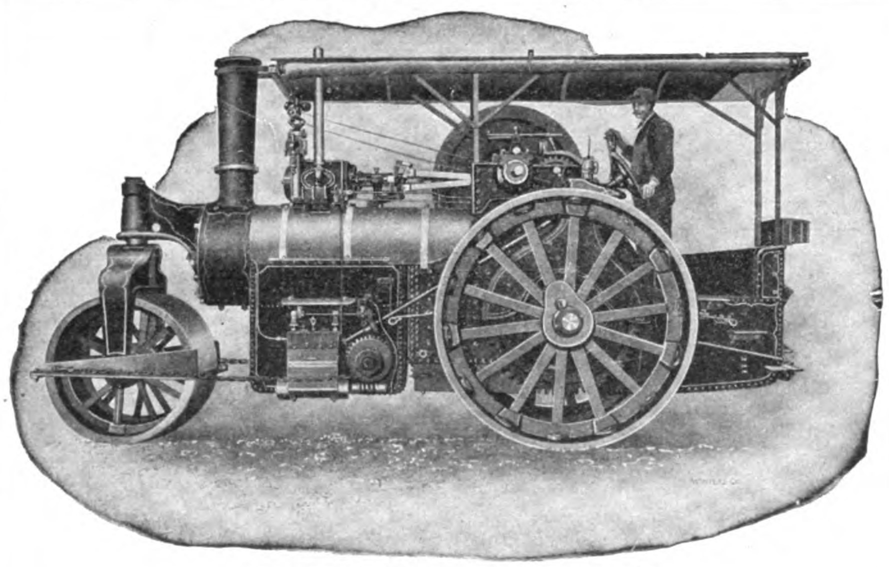

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COMMERCE • ENGINEERING • FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, AUGUST, 1906. No. 3.

(Courtesy of "The Manila Times")

THE HONORABLE SECRETARY OF WAR, Wm. H. TAFT,
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MANILA, SHANGHAI AND YOKOHAMA, JULY 1906

"DO WE WANT TAFT?"

"Secretary Taft was a tower of strength in the tariff fight at Washington. He is almost the sole hope of these islands in securing favorable legislation from Congress. Should he go on the Supreme Bench the Philippines will be left poor indeed. But for him we would not have had even a ghost of a show of victory in the fight which has just ended there. His retirement to the Supreme Court means a loss to the Islands from which it will take years to recover and I can conceive of nothing which will compensate us for it. There is no man living keenly interested in the Islands who wields or is likely to wield anything like his political influence in Washington. The energy and enthusiasm which he devoted to our cause will probably never be commensurately realized and appreciated here."—George Bronson Rea.

In view of subsequent local comment, we desire to again call attention to the above expression of opinion, which appeared in the *Manila Times* under date of June 30th, ulto., and to reiterate the sentiments therein contained. The critics of the Secretary of War residing in these Islands have permitted their old petty animosities to influence their views and blind them to the high character of the individual and the rare qualities of statesmanship which have made him in two years the most efficient cabinet officer of the Administration, and the possible candidate for the next Presidency. The line of policy pursued by Taft which brought him into conflict with certain interests and earned their cordial dislike and ill will, was the direct result of the instructions outlined to him by the administration. When Taft arrived in Washington to assume the portfolio of War, the older statesmen at the capital predicted his failure, and for a while even his friends miscalculated his strength. But it proved later on that he was only gaining a breathing spell after his long residence in Manila, and picking up the loose ends of his rope, and then when he went to work he surprised the country. This is no exaggeration of words. We have listened to one after another of the leading journalists of the country representing their papers in Washington, telling of the wonderful progress made by the Secretary of War, his untiring energy, attention to work and ability to meet and cope with the weightiest problems. No other cabinet officer has ever been called upon to address Congressional Committees on difficult legislation as frequently as Taft, and none has ever secured such attention and deference to his views. One day he appears before the Committee on Inter-Oceanic Canals, and proves to be an expert on canals, the next day before an appropriation committee to secure favorable action for some army appropriation, requiring technical elucidation, again it is Railroads for the Philippines, calling for a thorough insight into the actual conditions of the country, and then before the Philippines Committee as a tobacco expert, in the effort to secure the passage of the tariff bill,—and we can state that no professional expert could have proved a better witness,—and again as a sugar expert and so on. Manfully has he labored to redeem his promises to the Islands, and to secure from an unwilling Congress that justice and equity which belongs to us as a part of the United States, which he has contended for through thick and thin, and whatever gain we have made against our political opponents is due entirely to his tireless endeavor and to the prestige he has gained in Washington.

In trying to carry out his promises to the Islands, he has incurred the deep resentment and political hatred of the beet sugar element who have not hesitated to call his patriotism and motives into question, and openly sneer at his efforts to uphold the honor of the country in our pledges to the Filipinos. The personal side of the campaign to besmirch his integrity and standing, and the pressure exerted against him by an influential portion of his party, in the hope of halting him in his efforts in our behalf, would have been successful with a man of less character and stamina. This opposition, however, has only served to strengthen him in his work and fix his determination to carry on the fight with more energy.

That there should be any doubt as to whether the Islands need Taft any longer or not, is not so much the intended reflection on his worth, as it is on the good judgment, intelligence, sense of fairness and gratitude of those he has struggled to benefit.

"Do we want Taft?" The question is put forward by the *Manila Times* in answer to the many adverse criticisms of the policy laid down under his administration.

Do we want justice for the Islands, do we want the islands to prosper, do we want new capital to develop our immense natural resources, do we want free trade with the United States, do we want our national pledge to the Islands redeemed with honor, so as to afterwards hold up our heads as true Americans? Do we want these and more?

Then we want Taft.

With Luke Wright shelved as Ambassador at Tokio, away from active politics in the States where his influence would count in our favor; with General Edwards an invalid in Arizona, removed from his place at the head of our Bureau in Washington, and Taft elevated to the Supreme Bench releasing him from a seat in the Cabinet, who will come forward to champion our cause in Washington? What man with sufficient knowledge of the Islands and their conditions, coupled with a national reputation and ability to impress his views on an unsympathetic Congress, can the critics of Taft produce to take his place?

There is absolutely no one in the United States, who, understanding our necessities, has the required prestige to command attention except William H. Taft. Any legislation for our industrial or commercial advancement would have little chance in Washington if fathered by anyone else, and we need Taft there.

CONVICT LABOR.

The problem confronting the Insular Government as to how to employ the convicts in Bilibid to the best advantage has been a source of much study on the part of Commissioner Forbes during the last year. The local merchants complain bitterly of the competition in various articles made by prison labor, seriously affecting the trade in furniture, carriage making and other lines. While all admit that the prisoners should be employed at some profitable labor, they are willing it shall be anything else but their particular line. They point to the building of roads and other public works as the proper outlet for the energies of the convicts, but experience has proved that where the Government has experimented along these lines, the cost of guarding, and feeding, and the risk of escape is so great that it is cheaper and safer to maintain them all under guard at one spot, where fewer men can hanlde them, and their labor utilized to better advantage.

With the already large number of long time prisoners taxing the capacity of Bilibid, the problem is one demanding considerable thought, and can not be solved off hand.

The establishment of a penal colony on one of the smaller islands of the archipelago would seem to be the ultimate way out of the difficulty where the convicts could be employed along similar lines as in other Eastern countries. In India the Government maintains a penal settlement at Port Blair, in connection with immense cocoanut and other plantations, the former proving the most useful. The extraction of the oil from the nuts and the conversion of the husks into coir have proved suitable and profitable outlets for convict labor, whilst not conflicting with any line of manufacturing. The cardinal principle must not be overlooked that employment must always be subordinated to the maintenance of strict discipline and the provision of purely penal labor. *Capital*, the leading financial journal of Asia, gives the following results of the year at Port Blair: "The outturn at the cocoanut oil factory during the year 1904-05 was 142,195 lbs. of oil, 106,700 lbs. of oil cake and 29,929 lbs. of coir. Of the oil manufactured 71,477 lbs. were sold in Calcutta, realizing the sum of Rs. 11,042. The Viper factory contains six mills which were worked daily during the year giving an outturn per diem of 8,687 lbs. of oil and 6,514 lbs. of oil-cakes. The plantations, according to the last report, contained 49,273 trees in bearing and 60,954 trees not in bearing."

Something along that line might result advantageous to the Islands. If a suitable island with existing cocoanut plantations is not available, the convicts could be set to work to planting the necessary trees, and the oil mill and fiber machinery installed at a latter date, resulting in time in creating a profitable revenue to the Government.

BUSINESS FAILURES IN MANILA

Following swift on the failure of an American book company, comes the announcement of the withdrawal from business of a large hardware and plumbing concern. To the average mind these incidents convey the idea that business conditions in Manila are going from bad to worse, when as a matter of fact the reverse is the case.

Nearly all the business failures here, and there have been quite a number in the last

two years, are not due so much to bad conditions, as to the lack of common, ordinary every day horse sense on the part of the merchants themselves. Because a man with money to invest sees, or thinks he sees, some one making a fair living in a particular line of business, he believes by putting on a better front, and spending money more lavishly, he can take the business away. The stationery, book, and printing business in a town of a few thousand Europeans made a good fair profit for one or at least two concerns, yet others jumped in with expensive stocks, high rents, and extravagant management, and the result has been four failures in the last two years and the retirement of ten more. The unsuccessful merchant cusses out the town as no good, and leaves the Islands only to comment unfavorably on conditions here, when as a matter of fact the entire fault is traceable directly to his own lack of perception.

Now comes the withdrawal of a large American plumbing firm from the Islands, which may be traceable to the disaster to the parent house in the San Francisco earthquake, but the fact remains that when they established themselves here over a year ago, the field was already well covered by good responsible firms.

Newspapers are another source of disappointment. Most any body thinks he can run a successful newspaper, and beat the other fellow out, but in a limited field like Manila, where there is just so much to be expended in advertising, it means that sooner or later someone has to go to the wall. The merchants, beset on all sides by irresponsible publishers and advertising solicitors, soon weary of the annoyance and confine their patronage to the responsible papers.

We have had a deluge of new publications in Manila whose only excuse for existence has been to secure advertising. They serve no purpose, have no standing, and draw down on the community the ridicule of outsiders. But experience fails to convey to the optimists that the field here has been worked to a frazzle, and a long suffering commercial community is crying for a respite.

But still they come, and we are now threatened with another publication from a native syndicate, who are going to revolutionize the printing and newspaper business of the Islands. Veremos.

PROTECTION IN THE PHILIPPINES

A correspondent of the *Globe* calls attention to the Protectionist Policy which is ousting British trade from American possessions. He says that:—"In the East Indies the same pressure is being exerted in favor of the United States which is being exerted in the West Indies. The only barrier to complete free trade between the Philippines and America is a clause in the treaty with Spain, which terminates in 1909. But it is no more effective against tariff manipulation than the 'sovereign rights' of Cuba. Moreover, on July 1 the navigation laws of the United States come into force in the Philippines. A similar move in Hawaii transferred the carrying trade, which was once in our hands, to America. What reason have we to suppose that the course of things will be any different in the Philippines? None at all. There is absolutely nothing before British shipping interests here but extinction. How great these are may be gathered from the fact that 75 per cent of the exports and 60 per cent of the imports are carried in British bottoms. But that is only one form of our activity in the islands. In Manila there are twenty British firms; two out of three banks are branches of British corporations; numerous British shipping and insurance companies are here represented by local agents: and British energy and capital are behind most of the great undertakings in the islands, whether the world knows it or not. The only railway in the country, that from Manila to Dagupan, is owned by a British company, and so ably it is managed that the American authorities on the spot could do nothing better than entrust its extension to the same competent hands. As for the rice and sugar mills inland, most of them are under British control. Unfortunately, however, the hemp trade is passing rapidly to the United States. For, by an Act of Congress in 1902, it was enacted that the products of the Philippines, if shipped direct to the United States for consumption there, were to be admitted free, and the export duty imposed in the islands returned. The result is that whereas America once took half as much hemp as Great Britain, she now takes twice as much. Whatever it may be on paper, the advantage to the American importer works out at £1 10s. per ton. Nevertheless, Lord Lansdowne once told the House of Commons that Washington had given the Foreign Office assurances that there would be no preferential treatment in the Philippines. As these are useless without action, it is easy to see why we allow Ministers to cheapen themselves by asking for them.

Our interests in the Philippines are greater than they are in Cuba, and so also is the menace to their permanence. In 1905 the value of British exports to the islands was £1,0:0,081, and the value of the exports from the empire as a whole £3,332,192, nearly three times as much as the total of trade from the United States. But to understand the situation with regard to the future one must compare the figures for British and American trade for the past 15 years. In that time the trade of the latter has risen by nearly 50 per cent, while that of the former has declined by one half. No blame is to be attached to the British merchant, whose pluck is a marvel. With a fair field and no favor he can hold more than his own against all comers, in the Philippines or anywhere else. But he cannot fight indefinitely with rivals behind whom is the whole force of a Government. If we do not adopt some form of retaliation within the next year or two six millions' worth of trade will be lost to us in Cuba and the Philippines as surely as a proportionate amount has been lost to us in Hawaii and Puerto Rico from the same cause"

(London and China Express.)

Self preservation is the first law of nature, and in making provisions for furthering its own trade, the United States is only repeating in the Philippines what the British shipping interests have accomplished for England. It is true that a large portion of the hemp trade has been diverted from England to the States through the abolition of the export duty on direct shipments. Previously, owing to the shipping monopoly being in British hands, London was the hemp market of the world, and until the above law was enacted, the United States was compelled to buy its Manila hemp through these channels. As a wise and far seeing Congress declines to subsidize or favor American shipping, the remission of the export duty was the only way to free the American purchaser from the extra charges imposed by the shipping monopoly. If the shoe begins to pinch the other way, we do not see where there is any great complaint coming.

The predominance of British firms in the Islands dates back to Spanish days, and their complete control of the trade was largely due to the fact that Spain was not a manufacturing or exporting nation, and the needs of the Islands had to be supplied from a more favored country. With the changed condition of affairs, American firms have entered the field, and as the greater part of the business has emanated from official expenditures, it is to be expected that such trade has favored American manufacturers, though this does not imply that there has been any undue favoritism, as everybody has been on an equal footing and in many instances important orders have been placed with foreign firms.

Britain still leads in the imports of cotton goods and other necessities, and it is only in machinery and food stuffs that Americans have passed them.

The falling off in the volume of British shipping cannot be traced to any laws or restrictions enacted by the Americans, but to the same reasons underlying the decline in other parts of the East, or to German and Japanese subsidized competition. The three American lines entering Manila do not more than counterbalance the withdrawal of the large steamers of the Cia. Trasatlantica Española, who held a veritable monopoly under the Spanish rule. The Coastwise Shipping Law to which the writer objects, and which he has stated goes into effect on July 1st, has been postponed until 1909.

We do not anticipate that the Britisher will be so easily driven from the field, and as they still hold the bulk of trade in their hands they will continue for a long time to derive the benefits arising therefrom, as it will take years for American firms to so establish themselves. They will only have themselves to blame if they are ousted from their position.

MINING BOOM IN THE PHILIPPINES

Present indications point strongly to a boom in Philippine gold mines in the near future. The development work in Masbate has uncovered large quantities of good paying ore, and new claims have been located and registered. Five companies are now at work there with dredges and mills and good results secured, with all indications to better and richer ore and pay dirt as the work progresses.

The Mining Bureau is soon to make an official report on the Masbate ore beds and placer fields, and it is to be hoped that the Commission will either rescind its order to curtail reports, or find some way in which this important information can be scattered broadcast and do the most good.

FORESTRY INFORMATION

The Bureau of Forestry has initiated a campaign for the gathering and publication of interesting popular information concerning the forests of the Islands. Much valuable data, which would be of incalculable benefit to lumberman and assist in attracting capital to develop the industry, is lost in the dry, voluminous official reports, when they are seen only by a few government officials. The information secured by the Bureau is of such importance to our industrial progress that the effort of Major Ahearn to have it placed before people who will read it, is to be highly commended.

REVIEWS

City Roads and Pavements: The third edition of this valuable book has been issued by the Engineering News Publishing Co. The author is William Piersen Judsen.

The local features of the first edition have been omitted, and modifications made to show the present applications of general methods. The feature of the book is in its concise and accurate treatment of the subject, from a practical standpoint, and excellent illustrations. Mr. Judsen is an authority on his subject having devoted many years to road making, and the book should be in the hands of all city engineers, who desire to keep posted on the subject and benefit by the experience of one so competent in this important branch of municipal engineering.

The chapter on concrete base is of exceptional value, as are also the tables relating to the steepness of grades for best results with various pavements, giving actual instances for the comparisons.

A brief history of different pavements and the methods of construction, cost, and other interesting data are also given.

"City Roads and Pavements:" by William Piersen Judsen. Published by the Engineering News Publishing Co., New York, or Archibald Constable & Co., Ltd., London. Price $2.00 net. Orders received through FAR EASTERN REVIEW.

Electric Power Plants: Second Edition; Electrical Instruments and Testing: by Norman H. Schneider. These two books, now in their second edition, can be recommended to the professional as well as the amateur electrician for the wealth of practical data, formulae, and rules indispensable for one who desires to keep abreast of the rapid improvements of the times. Up to date wiring rules and diagrams, based on the specifications of the National Board of Fire Underwriters, are given, and explanations detailed wherever necessary.

The first named book is divided into eight chapters covering the theory underlying electrical apparatus, standard wiring, direct and alternating current generators, motors and motor starting, testing and measuring instruments, the storage battery, the incandescent lamp, and general engineering notes. It also contains twenty-two tables covering important and every day electrical problems and 203 illustrations and plans.

In the book on Instruments and Testing, the electrician will find data and rules on all tests such as occur in daily practice, in the power house, on the lines, or in the technical school. It contains 105 illustrations.

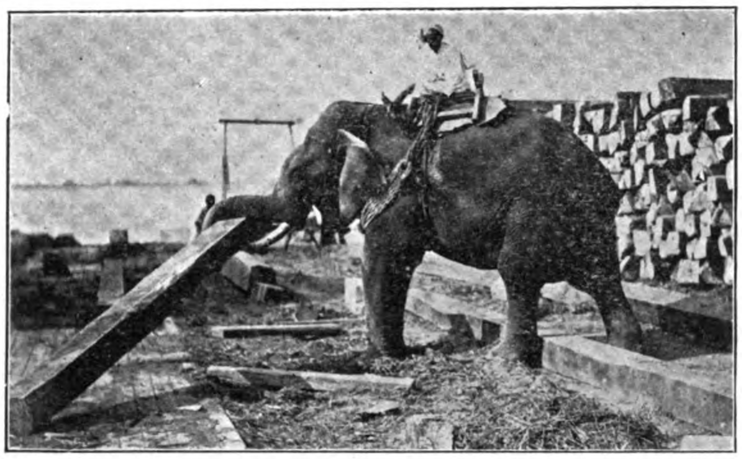
Electric Power Plants: by Norman H. Schneider, published by Spon and Chamberlain, 123 125 Liberty St., New York; 290 pages, 205 illustrations, cloth, $1.50; full limp leather, round corners, gilt edges $2.50.

Electrical Instruments and Testing: by Norman H. Schneider, published by Spon and Chamberlain, 123-125 Liberty St., New York. Cloth $1.00, leather $2.00.

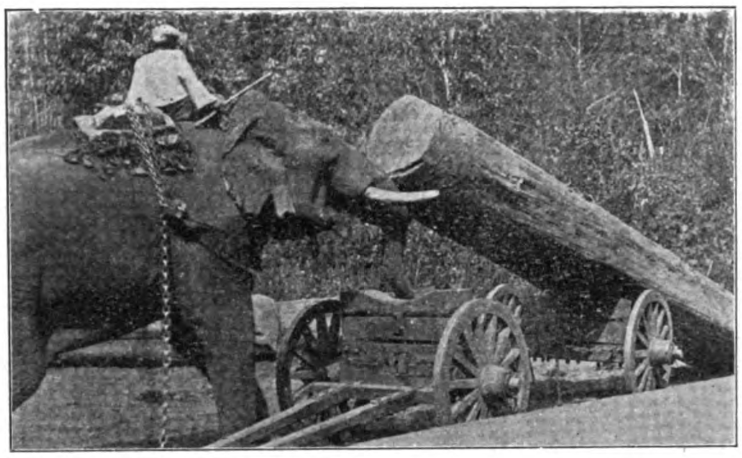
LUMBER TRADE OF THE FAR EAST

(FROM "THE TIMBERMAN," JUNE 1906.)

PORTLAND, OR.



"ELEPHANT A-PILING TEAK"



ELEPHANT UNLOADING A ROUND LOG

C. L. Seitz, managing director of the China Import & Export Lumber Company, Limited, of Shanghai, China, has been spending some time in Portland. The company which Mr. Seitz represents has branches throughout China and is one of the largest lumber firms in China. They handled last year about 35,000,000 feet, which was about 13 per cent of the total imports of lumber into China.

For several years past this company has been exporting hardwoods to the United States, principally oak, which actual use has demonstrated to be the equal of the best American oak and for which this country offers a ready market. The oak comes in the squared log and is re-sawn at the local mills. In order to be able to handle the hardwood business on the Coast to the best advantage, Mr. Seitz has organized the Pacific Coast Hardwood Manufacturing Company, in which Portland capital is interested. It is the intention to erect a mill suitable for sawing hardwood, located on the water front in this city, where a stock of Philippine, Japanese, Siberian, Borneo and Sumatra hardwoods would be carried. The hardwoods which will probably find the largest sale in this country are oak, ash, elm and mahogany. The Pacific Coast Hardwood Manufacturing Company will have branches in Vancouver, B. C., Seattle, Wash., and Portland, where the sawmill will be located.

FURNITURE FACTORIES.

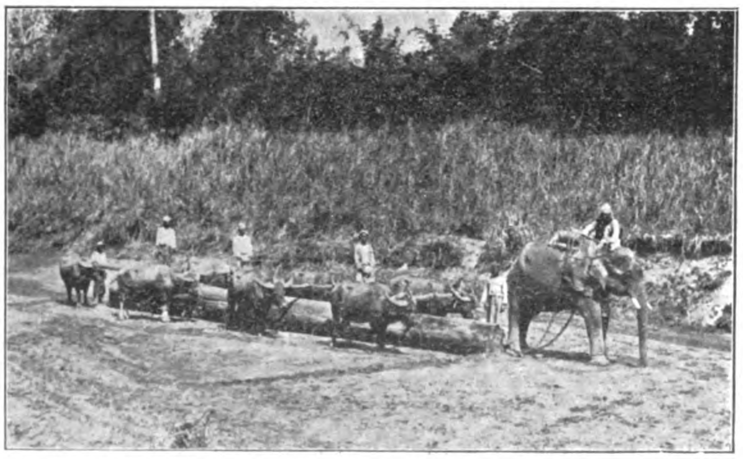
"If our plans succeed," says Mr. Seitz, "as we hope they will, the Pacific Coast Hardwood Company will be the means of assisting in building up the furniture business on the Pacific Coast. Heretofore all your Eastern hardwoods have had to be imported by rail at a very heavy cost for freight alone. We expect to be able to lay down equally as good furniture woods from the Orient at a cost less than the Eastern factories have to pay for the same quality of material on American hardwoods. The only thing that has retarded the growth of the furniture business on the Pacific Coast has been the extreme difficulty in receiving suitable woods for high-grade furniture purposes.

HIGH PRICES REDUCE CONSUMPTION.

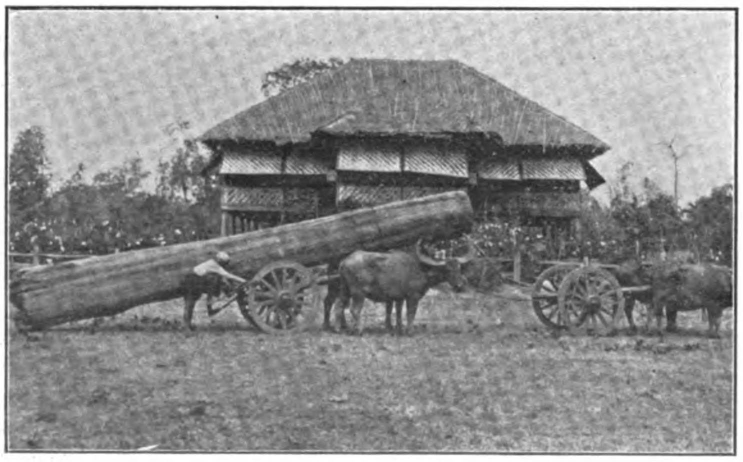
"I think the manufacturers of Oregon pine will make a mistake if they continue to advance the price to any considerable extent, as it will result in bringing other woods into competition as well as lessening the demand. For centuries the Chinese have used poles in the building of their houses. These poles are cut in the Honan and Fukien provinces. About sixty million of these poles are produced annually. These poles constitute the lumber business of China. They vary in length from twelve to sixty feet and are used in the same manner that ordinary house dimension is in the United States, the frame being constructed of the poles and covered with boards secured largely from Japan. These poles are a species of cedar with a red heart. They are cultivated; are planted very close together and a pole sixty feet long will often not be more than nine inches at the butt and more than half of its entire length will be without a branch. The price received is about $24 gold a thousand feet, and they are figured on a basis of the cubical contents, the diameter being taken six feet from the butt.

YALU TIMBER.

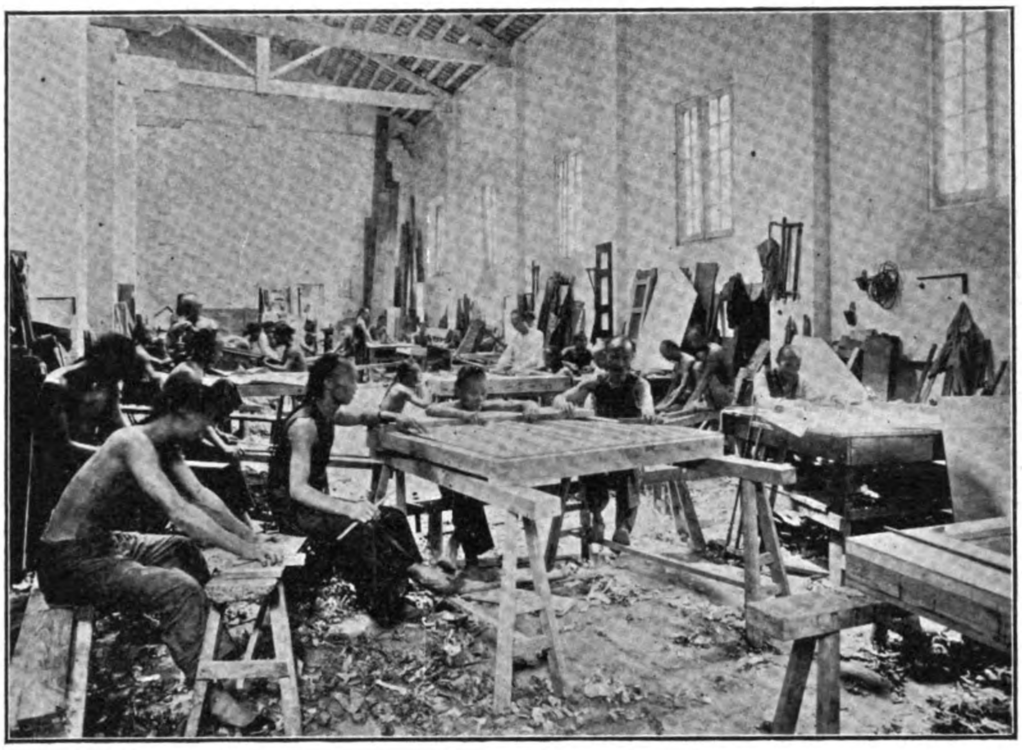
"The timber on the Yalu River is a species of pine. It attains a size of three to four feet on the stump and will yield three to four 16 foot logs. The wood is grayish in color with a very pronounced grain, free from sap, very soft and dry, and yields a good percentage of clear, but has no fiber and checks badly. It is very inferior to Oregon pine for building purposes. The timber stands quite thick on the ground. The logs are cut and rolled in the rivers in the Autumn and Winter and driven distances of 150 to 300 miles, and find a market in the ports of Northern China, and bring about $10 per thousand feet in gold. A Russian company, which was managed by Baron Gunsburg, had a large timber concession on the Yalu River, which it obtained from the Corean government. It was over the occupation of this concession that was the direct cause of the Russian and Japanese war. The cost of felling and sawing the timber on the Yalu is about $3.50 to $4.00 per thousand, cut into one-inch boards. The work is done entirely by hand. The wages paid are from 7½ to 10 cents per day. It costs about half a cent per meal for food for the coolie. For half a cent he his able to secure a large bowl of rice and a piece of dried fish. So you see that while the wages are very small the cost of living is correspondingly cheap.



ELEPHANT AND WATER BUFFALO SKIDDING A LOG



LOG LOADED ON BUFFALO CART



CHINESE CARPENTERS AT WORK IN ROBINSON PIANO FACTORY, HONGKONG

TIMBER OF JAPAN.

"Japan is the great basis of supply for lumber for China. The Mitsui Bussan Kaisha is the largest lumber firm in Japan with headquarters in Tokio. This company owns and operates extensive tracts of timber land in Hokkaido, Nippon and Sakhalien Islands, and practically controls the Japanese lumber business. The output from the forests last year was 160,000,000 feet, and it is estimated that this will be doubled for the current year. We are the Chinese agents for this company. The timber on Sakhalien island, which is now owned jointly by Japan and Russia, is valuable chiefly for pulp making purposes. The forests in Hokkaido are quite extensive and produce a great variety of woods. On the island of Nippon the imperial family owns a tract of fir and cedar. This forest was planted 300 years ago and is 350 by 150 miles in area. The timber is not on the market.

"The pine of Japan is similar in character to that of the eastern spruce of the United States. It is a light cream in color and practically free from sap. You can cut a tree right through the center and it is difficult to tell which part is heartwood and which is sap. The annual rings show but slightly. When dressed it takes a lovely satin finish and is a very pretty and useful wood. The only drawback is that it is soft. A large number of beautifully figured woods are found in the forests in Japan, and it will not be long before they will become known and sold on the markets of America and Europe. The work as carried on in the forests of Japan now is crude, and no proper method of selection and grading is observed, with the result that much of the most valuable timber cut is converted into railroad ties regardless of its true value. Large quantities of these ties are contracted to be supplied within the next year or two to the railroads in Siberia, China, and other countries in the Far East; even South Africa being in the market for the purchase of these ties. There is, therefore, not much danger of the development of any considerable trade in fancy woods in this country at present, and it will probably take years before the system of selection in Japan will sufficiently improve to enable dealers to obtain regular supplies of any special fancy woods. There are, however, indications of a movement to open up large tracts of timber lands in Siberia, and our firm is giving special attention to this new field. The timber found in Siberia is of a high class and will command a ready sale in the Far East, while the oak, ash, maple and similar woods will be exported to Europe and America.

JAPANESE LOGGING.

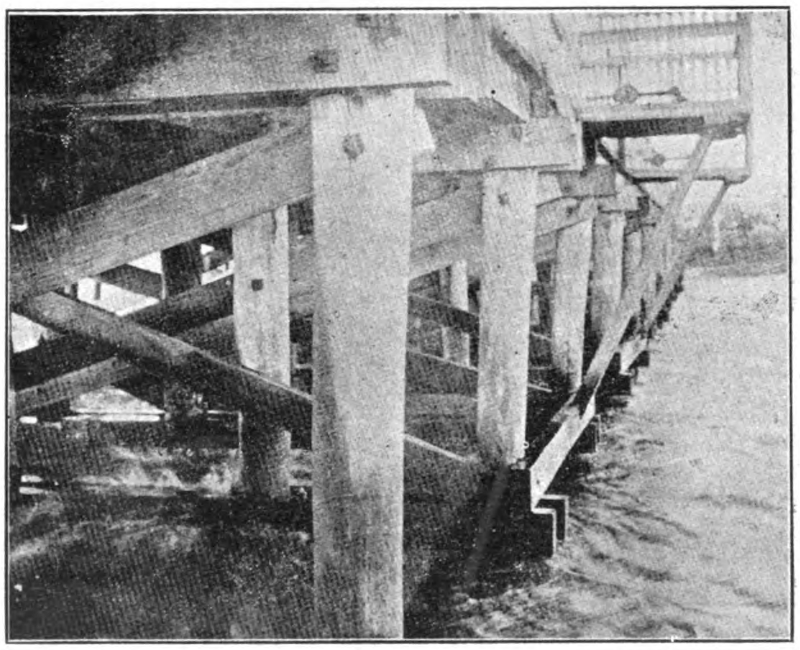
"In Japan logging machinery is practically unknown. Woods work is carried on in a very primitive manner. The investment in equipment is, to say the least, not very heavy. In the early Fall a large number of Japanese coolies are engaged and sent into the forest. The coolies are accompanied by their wives and children. The operating company furnishes them with rice, fish, clothing and other necessities for the season. The men fell the trees and the women and children hew them into squares with axes; then they are dragged to the rivers and creeks, where they are left for the Spring freshets to carry them to the larger streams and there to the mills. The logs are cut in 14, 16 and 18 foot lengths. Each coolie puts a stamp on the logs he cuts before they are rolled into the gorges. When the accumulated snows of the Winter melt they are floated to the mills, where the Winter's work of the individual logger is checked up and credit is given him. If the man has an energetic wife and a large family he will make one yen a day, which is equal to about 50 cents gold. From this is deducted the cost of the food and clothing supplied him at the beginning of the season's work.

TIES FOR MEXICO.

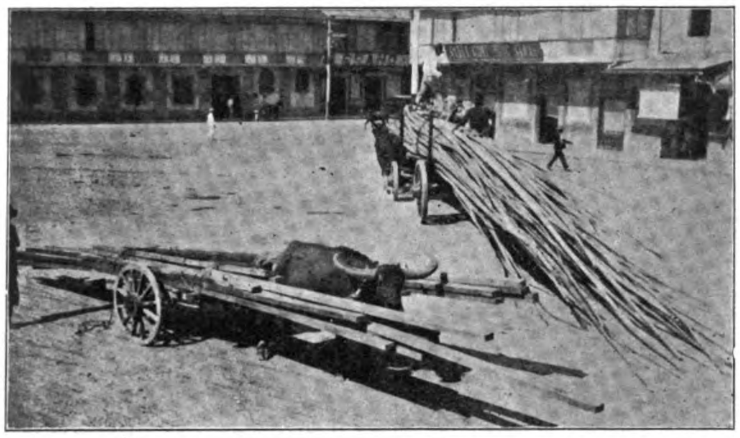
"The Mitsui company is supplying 300,000 ties for the construction of a new railroad in Mexico. These ties are principally oak, and are being transported by the Dollar Steamship Company. They are loaded at Mororan.

"Our company handles Oregon pine, California redwood, Japanese timber, Borneo and Philippine hardwood and part of the local Chinese product. We sell each year from thirty to thirty-five million feet. Our imports of redwood only aggregate about five hundred thousand feet. We had quite a good trade in California redwood up to about two and a half years ago, when the mills raised the price to a prohibitive rate. This caused the architects in China to specify a wood called meranti, which comes from Singapore and answers equally well for building purposes. It is a semi-hardwood and sells for about the same price as Oregon pine. In character it resembles rosewood but with a much coarser grain. Clear redwood in China brings about $35 to $40 gold a thousand feet. It is used almost entirely for doors, windows and fancy finish. The hand carvers like it because it works easily. We have a sawmill of our own in Shanghai, where we resaw large quantities of timber of all kinds. It has a capacity of 40,000 to 50,000 feet per day. In connection with our sawmill we have a box and case factory. We make annually several million cases for coal oil, supplying both the Dutch and Standard Oil Companies. I have been wondering if we could utilize the thousands of cords of wood lying about Portland for the manufacture of oil cases. Am afraid the handling and freight would not make it profitable, but shall look into it.

"We keep on hand large stocks of Philippine woods and also the woods from Borneo.



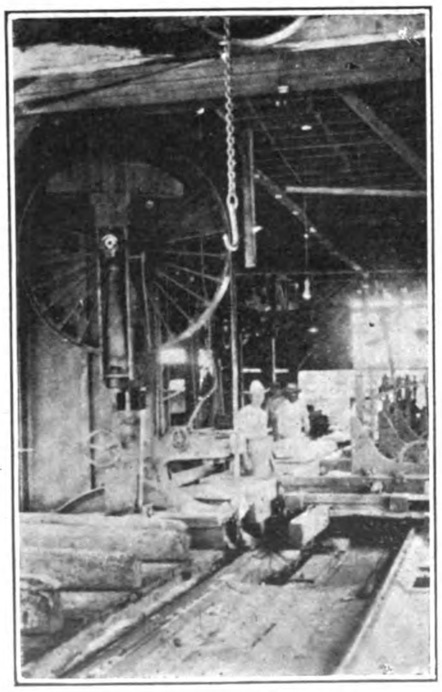
WHARF BUILT OF JARRAH PILES, FROM MILLAR'S KARRI & JARRAH CO., LTD.



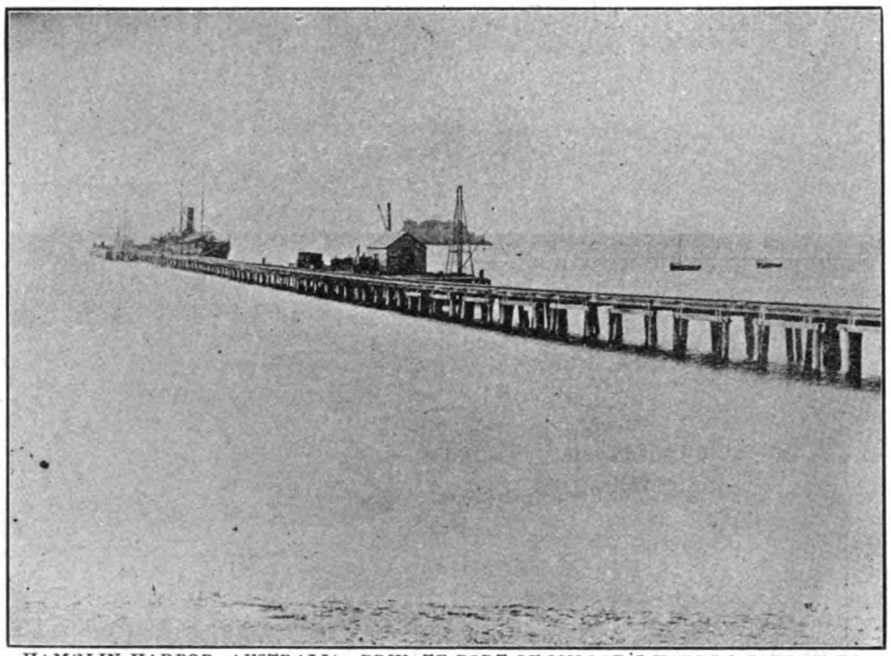
HAULING TIMBER AND BAMBOO IN MANILA

These woods are extraordinarily hard and heavy, and so far the exploitation of the forests in the Philippines and Borneo has not proven a paying investment. The timber growth is large and occasionally sparse. Very often the best forests are situated on marshy soil and the expense of transportation of the timber to the rivers is considerable, more especially as nearly all of these hardwoods will not float in water and must be transported by boat down the rivers to the seacoast for shipment to foreign countries. The native laborers on the islands are of a very low class, and Chinese are imported mostly for this work in Borneo, which makes the logging a costly proposition. In the Philippines, where Chinese cannot be imported, and the native tribes are not given to work, it is almost impossible to get wood cut at all.

"Our company has yards scattered all over Northern China. We ship by steamer and rail and even by camel into the interior. We do not operate at any point south of Foo Chow on account of the ravages of the white ant, which thrives on Oregon pine.

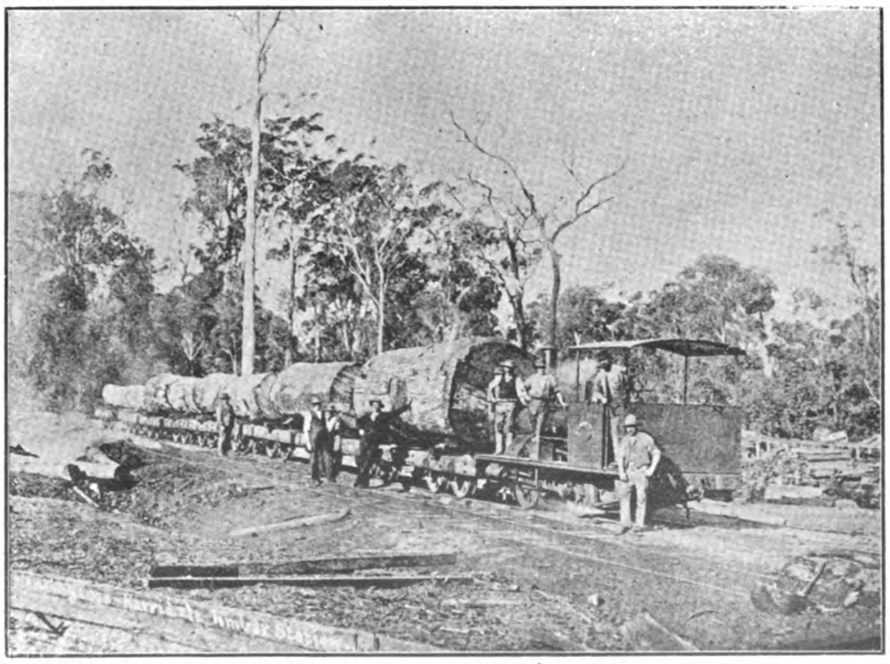


BAND SAW, PHILIPPINE LUMBER AND DEVELOPMENT CO.'S MILL



HAMELIN HARBOR, AUSTRALIA. PRIVATE PORT OF MILLAR'S KARRI & JARRAH CO. FOR LOADING TIMBERS

HAULING LUMBER IN AUSTRALIA, 27 HORSES, MILLAR'S KARRI & JARRAH CO.



LUMBER RAILWAY, AUSTRALIA. MILLAR'S KARRI & JARRAH CO.

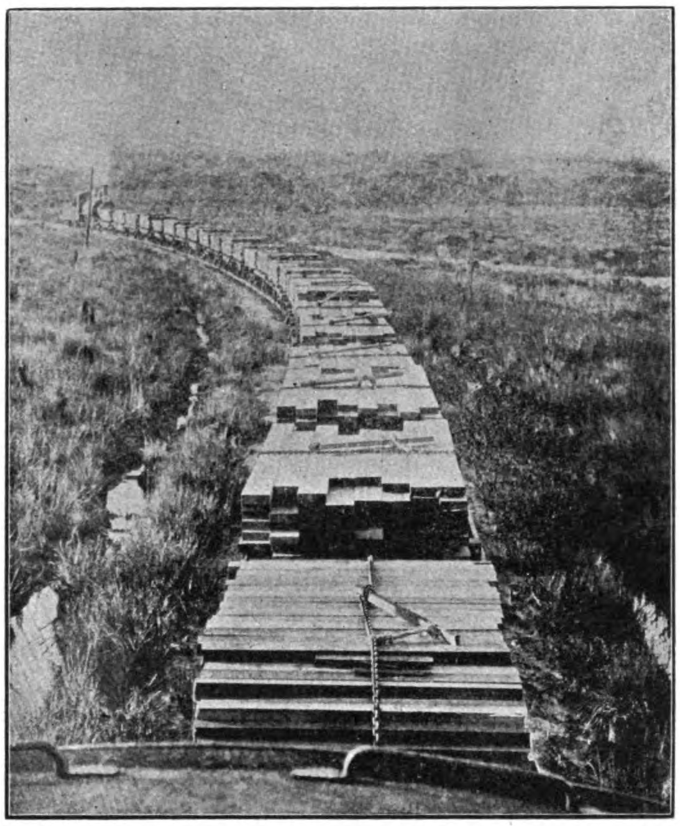
RAILROAD CONSTRUCTION AND OPERATION IN CHINA.

"China has three extensive railroad lines. One of the main lines which is owned by the Chinese government starts at Peking and ends at Newchwang. Another exists between Peking and Hankow. This line belongs to a Belgian syndicate in which the Belgian government has some interest. There is an English line being built from Shanghai to Nanking, and the Germans have under construction a line in Stohantung province. It takes about four days to travel from Peking to Hankow, going at a speed of about twenty miles an hour and running day time only. Trains do not run in China at night because it is not considered safe. The Mitsui Bussan Kaisha has supplied practically all the sleepers for these lines, which are new. The price of ties in China is about 45 cents gold delivered to the railroad company. The usual size tie is about 6X9X8. They are manufactured in Hokkaida island. Several large mills are located there, the largest being capable of turning out 4000 ties a day. Large circular saws are employed in cutting up the wood. Bandsaws are hardly used at all.

FINISHING ORIENTAL HOMES IN OREGON PINE.

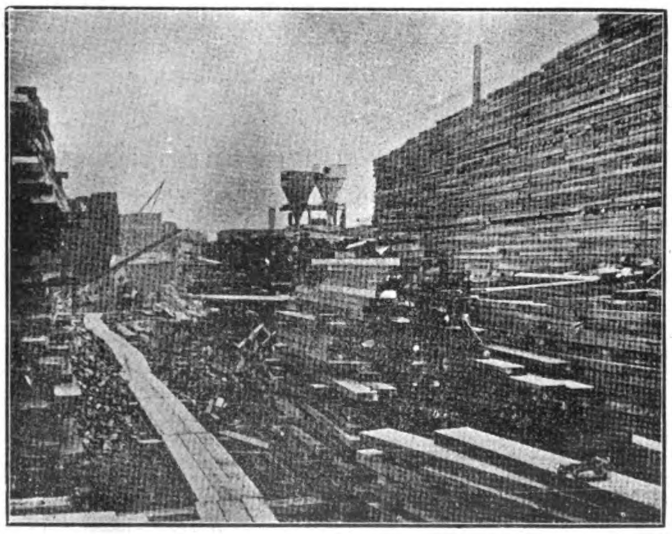
"People in the United States have vague ideas in regard to the trade in China. That country now is extremely prosperous and there are many opportunities for enlarging the sale of American goods. Many of the rich Chinese merchants are building magnificent homes. Cost is not a factor providing the ideas of the builder can be carried out. I have known instances where one of these builders would spend $50,000 to $75,000 on a 6-room house. They are fitted up with great elegance. The features of each building are the large amount of hand carved wood used in decorating and the statuary employed for the same purpose, which is built into the house. I have just received the plans for my new home from the architects. It occurs to me after seeing the beautiful effects which are possible in Oregon pine for interior decoration, that I shall finish my house in Oregon pine. It will be something new and novel. Every modern enterprising lumberman's house is expected to show the latest in design, finish and material, and if I can secure some good firm over here who will undertake to get out the entire mill work, put it together and ship in the knockdown, am seriously inclined to carry out this idea. This would prove one of the greatest advertisements for Oregon pine finish that could be secured in the Orient.

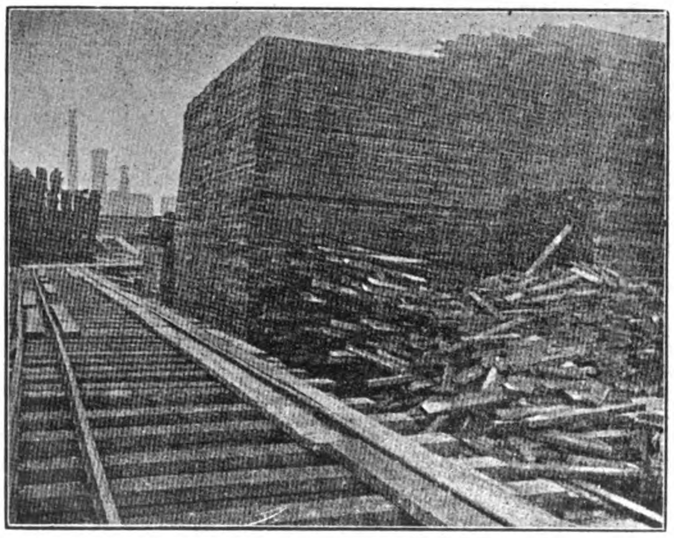
"Boycott? It looked formidable for a month or six weeks, and then practically died out."



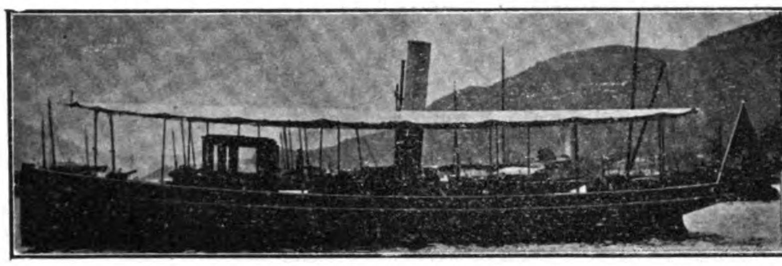
LUMBER TRAIN AUSTRALIA: THE MILLAR'S KARRI AND JARRAH CO.

INDIAN FOREST RAILWAY

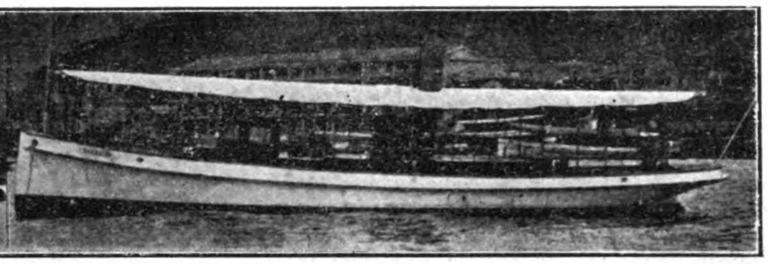




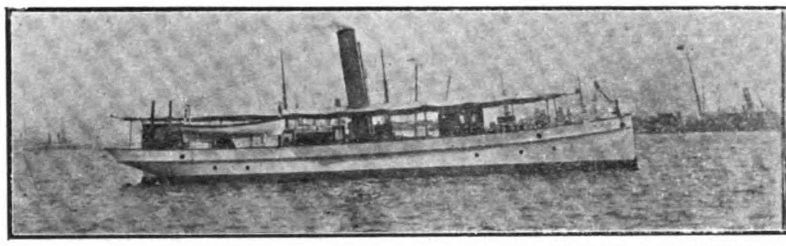
KARRI LUMBER PILE, AFTER FIRE TEST



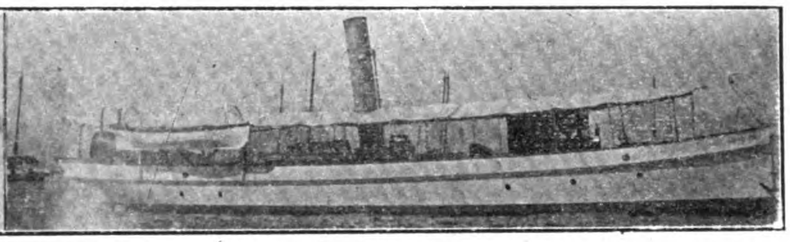
LAUNCHES BUILT FOR HONGKONG GOVERNMENT
50′x9′ 6″x5′ 6″, speed 9 knots



LAUNCH "SHAMEEN," BUILT FOR MESSRS. BUTTERFIELD & SWIRE
55′x11′x6′, speed 9 knots

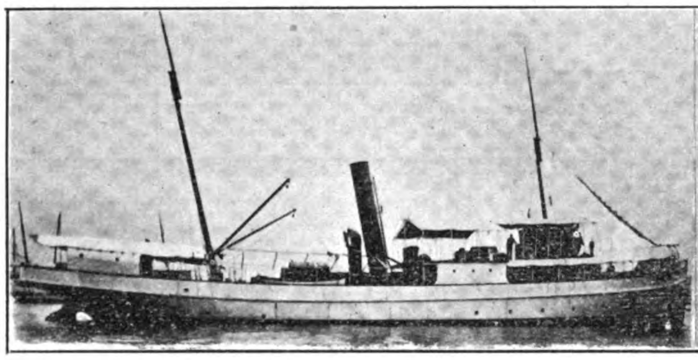


Speed 10½ knots

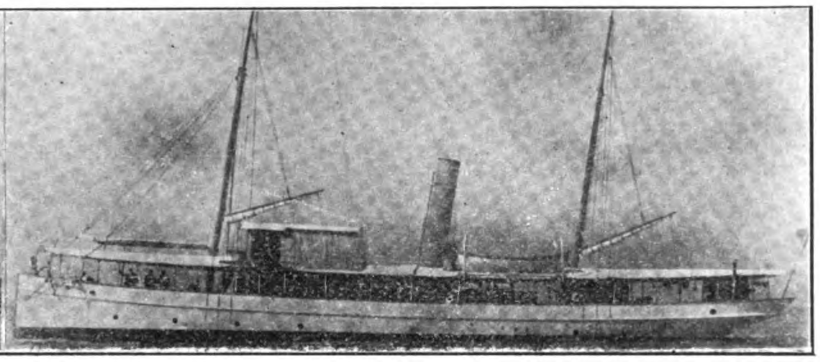


81′x14′x8′, speed 11 knots

POLICE LAUNCHES FOR HONGKONG GOVERNMENT



S. S. "A. M. BISBEE," PILOT STEAMER,
130′x24′x13′—Speed 10¼ knots. Built for the Shanghai Pilots' Association



S. S. "STANLEY," LIGHTHOUSE TENDER,
120′x20′x10′—Speed 12 knots. Built for Hongkong Government

SHIPBUILDING IN HONGKONG

CARMICHAEL & CLARKE'S ENTERPRISE

One of the most successful of the younger engineering firms of Hongkong is that of Carmichael & Clarke's. Although only ten years in existence, the high quality of work and general satisfaction given by this firm, has placed it in the front ranks of Eastern engineers and shipbuilders.

The present business was commenced in 1896 and operated under the name of H. F. Carmichael, as Consulting Engineer and Shipbuilder, and in 1899 Mr. B. J. Barlow was taken in, and the new firm became known as Carmichael & Barlow. In 1901 Mr. Barlow retired from business, dissolving the partnership, and the former name of H. F. Carmichael was resumed. In February 1903, Mr. Harold Clarke, the assistant of Mr. Carmichael, was admitted into partnership, and the present firm name established. Mr. Clarke's death in August, 1904, of typhoid fever, will be remembered by the engineering community of the East for the many expressions of sorrow which it elicited from his friends and associates from all parts of the Coast.

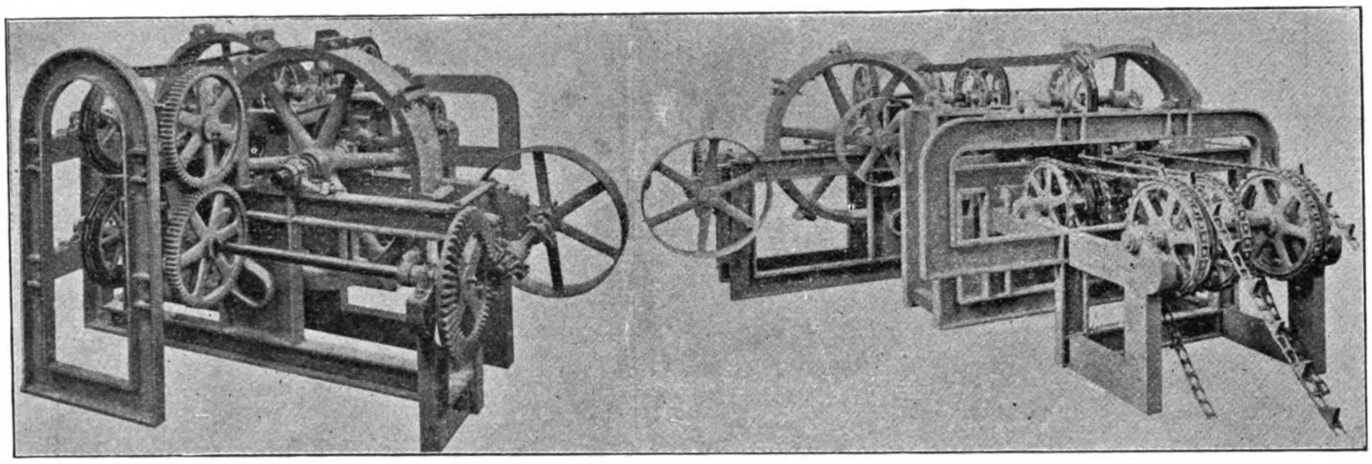
The business was resumed under the same name, with Mr. Carmichael as sole partner, with two assistants. Under this management the prestige and business of the firm has steadily increased, and the character and extent of the work undertaken has developed accordingly. From building small harbor and river steamers and launches, they have gradually developed the scope of their work to embrace the repairing and fitting out of large ocean steamships in which line they have been eminently successful. One of their recent contracts of this nature was of such importance, and carried out with such dispatch and success, that it called forth the commendation of the press in Hongkong, as it demonstrated the ability and resources of the smaller firms, who ordinarily are overshadowed by the larger dock interests of the Colony.

During the early months of the year the firm secured the contract, in the face of keen competition, for fitting up four large steamers as troopships, to carry Russian soldiers from Vladivostok to Odessa. The steamers were the Rippingham Grange, 10,000 tons, the Swanley, 7,000 tons, Haversham Grange, 11,200 tons and the Welsh Prince of 10,000 tons. The contract called for fitting cabins and bunks, hospitals, lavatories, ovens, galleys, rice and tea boilers, ice boxes of 100 tons capacity and water service piping, fittings, etc. The Rippingham Grange was equipped for accommodating 2,550, the Haversham Grange, 3,650, and the Welsh Prince 2,750. The work on the last two vessels, accommodating 6,400 troops, had to be completed within nine days, and it is a credit to the firm that the work was completed on time. Over 1500 workmen were employed, and the record of nine days established is one which could probably not be lowered in any of the larger engineering yards of Europe or America. The firm has had large experience in this line, fitting out the various steamers for the great South African coolie traffic.

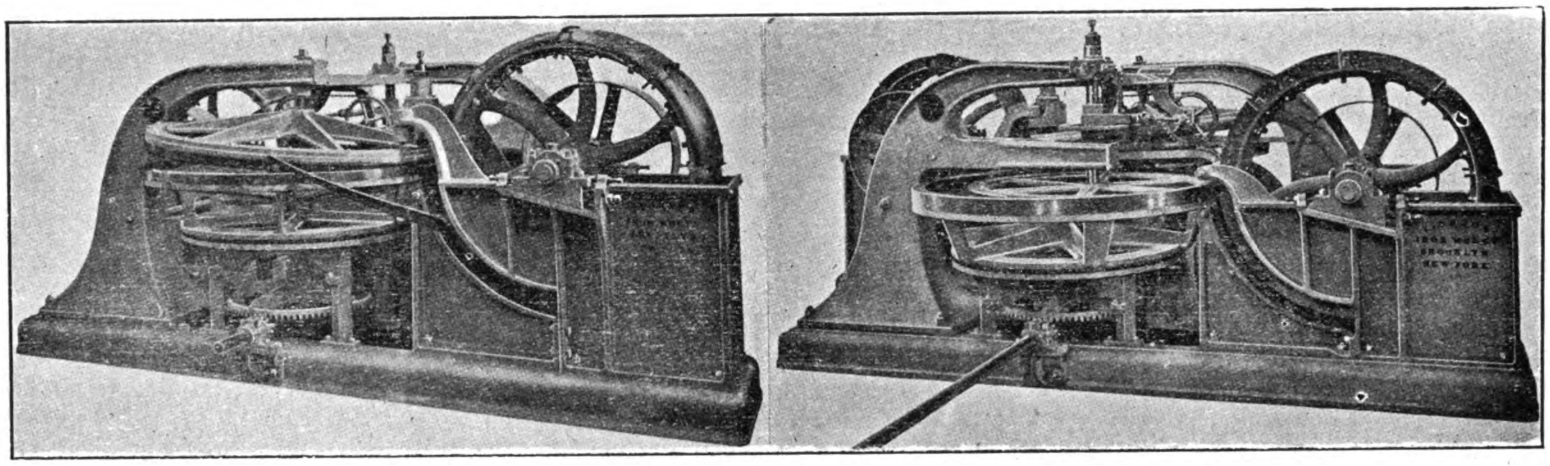
In June last, a branch office, operating under the same name, was opened in Singapore, in the face of an already powerful opposition. This step in itself is ample evidence of the business enterprise characterizing the firm.

In addition to the shipbuilding phase of the business, which is carried on at their yards at Sam-Sui-Po, Kowloon, Messrs. Carmichael & Clarke are also the Hongkong port superintendents for Messrs. Jebsen & Co. whose steamers ply between all the ports of the East, and also hold the same position for various Chinese steamship owners. They are also the sole agents in China, Straits Settlements and Federated Malay States for the Atlas Preservative Co. of London, with sub agencies covering the Philippines and Shanghai, and sole agents for the "Smooth On" Mfg. Co. of New Jersey, U. S. A.

We reproduce several photos of the types of river and harbor launches and small steamships built by this firm.



RUIZ-OSORIO FIBER MACHINE



TORROELLA FIBER MACHINE

PIONEER FIBER DECORTICATING MACHINES

FIBER MACHINERY

THE MOST SUCCESSFUL MACHINE FOR THE PREPARATION OF MAGUEY OR SISAL HEMP.

The increasing interest of the Philippine farmers in the cultivation of maguey, and the efforts of the Agricultural Bureau to stimulate its production, paves the way for the natural sequence of installing the proper type of machine, which will convert the fiber into a marketable state. In Yucatan and throughout Mexico. where this industry has attained a prominence only equalled by the production of abacá in the Philippines, many different machines have been tried and discarded before finding one uniting all the requisites for perfect and economical operation To Sr. José Torroella of Yucatan is due the credit for the invention of the most perfect machine for this work, which has superseded the others in the great sisal district of Mexico. The Pioneer Iron Works of Brooklyn, one of the best known manufacturers of sugar machinery in the United States, have secured the rights for the building of these machines, and their mark is a guarantee of good workmanship. The planters of the Philippines should write to the above firm or their agents and secure intelligent data and facts concerning this type of machinery, which once introduced will open up and develop another great industry for the country and bring under profitable cultivation lands unsuitable for other crops. The Bureau of Agriculture is encouraging the development of this industry, and has recently received 200,000 plants of maguey from Hawaii for transplanting in favorable localities.

The illustrations show different views of this machine, so that with little explanation any one may understand the modus operandi.

This machine contains no grip-chains that have to be dragged along, sliding under heavy pressure between an upper and a lower bar; all the friction of the grips in this machine is converted into rolling friction, so that almost all the power of the Driving Engine is used for the cleaning of the leaves in itself and a very small percentage for conveying while in all chain machines the conveying, absorbs about thirty per cent. of the power. The invention is the result of careful study and long practical observation of the working of all kinds of machines employed in Yucatan, Mexico, where the inventor has lived and worked for years, and where the Fibre Industry is developed more than in any other country, and in fact is the only industry of the country, enriching its people more than almost any other product of the most fertile soil on earth.

The first Torroella Machine built proved plainly that the principles involved in the invention were far superior to those of all other machines of the kind and one improvement followed the other, until today it is a faultless combination of simple mechanisms, doing the work it is intended for with absolute perfection. There is no part that is subject to any excessive strain, consequently no breakages and costly repairs, nor is there any more wear and tear than on a well built machine-tool.

While Yucatan remains the principal market for the sale of the machines several have been installed in Cuba and the Bahamas.

The machine, provided with a feed table (not shown in cuts) onto which the leaves are dumped, and more or less evenly distributed by one operator, will clean 15,000 to 18,000 leaves per hour, absorbing about 20 horsepower. Owing to the solidity of the construction, avoiding vibration, to the solid and sure grip of the leaves in the first grip-wheels and of the fibre in the second grip-wheels, the percentage of loss of fibre is reduced to a minimum, every part of the machine can be easily and accurately adjusted and will stay adjusted. No further attention is required except lubricating the bearings as in any machine of any description.

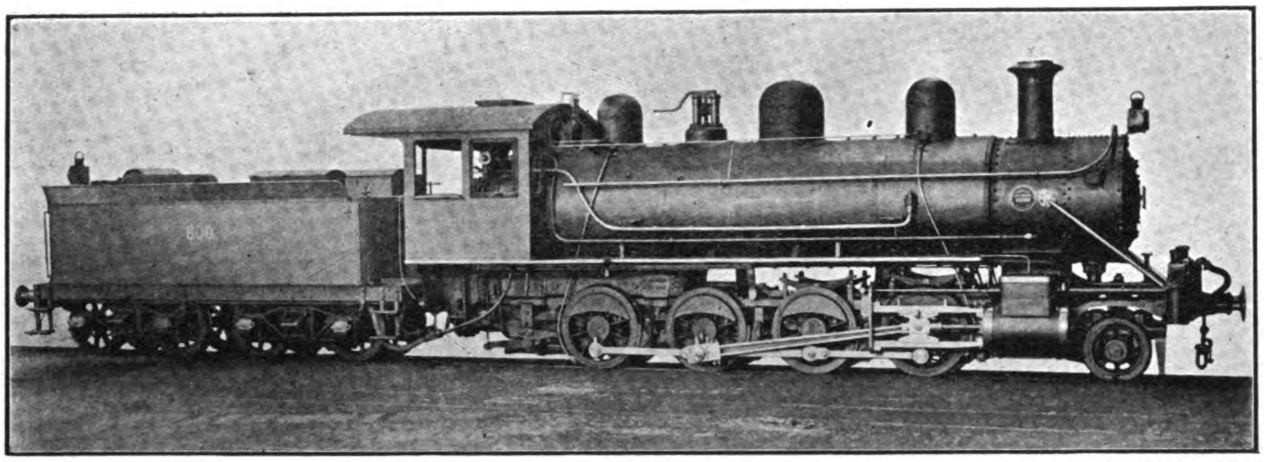
The horizontal wheel with its brass ring and the inclined wheel with its brass ring form the grip for the leaves and carry them between the first scraper-drum and the brass curve where about one-half the length of the leaves is cleaned. As the fibre passes from the first scraper-drum and curve (leaves still being held between the first grip wheels) it is carried over a guide and drops between the second grip-wheels forming a horizontal grip at their converging part near the second scraper-drum. When these second grip wheels grip the fibre the leaf is already free of the first grip, and this unscraped part drops between the second scraper-drum and curve and is cleaned there, the clean fibre emerging riding on the outer grip-wheel and is then taken off by a boy.

The grip-wheels revolve on balls and are driven from a shaft below by means of bevel gears and pinions; the vertical shaft of the lower first grip-wheels connecting with the upper shaft of the upper grip-wheel by means of a universal joint; the inner grip-wheel of the second operation is driven by its contact with the outer grip-wheel with fibre between their grips.

To insure a firm and secure grip, a pressure roller, rolling on top of the upper grip-wheel at its deepest point, and a strong spring behind the upper end of its shaft, keep the two wheels in contact, gripping the leaves strongly between them, while the pressure is almost vertically transmitted to the large ball bearing below.

At the second operation, the smaller grip-wheel is forced into strong contact with the larger, by means of a spring behind its hanging shaft inside the lower arm of the goose-neck. The inner wheel can be lifted or lowered to its proper position by means of nut and lock-nut at its upper end, and can move in and out according to the quantity of fibre between the grips, it oscillating in a trunion bearing in the upper arm of the goose-neck.

(Continued on page 104.)



BALDWIN LOCOMOTIVE, CLASS 10-30 E 32, BUILT FOR THE IMPERIAL GOVERNMENT RAILWAYS OF JAPAN, GAUGE 3′ 6″.

RAILWAY CONSTRUCTION IN CHINA

The United States and China, the two great continental countries lying in the Temperate Zone, are both ideal lands for gigantic systems of railways, but while the former has 1 m. of railway for every 360 inhabitants, China has about 1 m. for every 130,000 inhabitants. It was stated in 1900 that there were 30,000 ms. of railway in Asia, two-thirds of which belonged to British India.

The Trans-Caspian and Trans-Siberian Railway accounted then in its unfinished state for 3,200 ms., Japan had 3,200 ms., French Indo-China 120 ms., but in Cochin China, Anam, and Tonkin they were soon to have 2,400 ms. Java had 1,000 ms., Turkey in Asia 1,500 ms. finished and 600 projected or under construction, and Russia was to join Astrakhan to the general Russian railway system, while China at that time had only 300 ms. completed and owned by the Government, which it was stated were very remunerative, and European syndicates had obtained concessions for 3,600 ms. of railway in China, the construction of which is already well advanced. These will traverse regions rich in minerals and agricultural products. The splendid waterways afford great facilities for transit, and China is better supplied with waterways both natural and artificial, than any other country in the world, except, perhaps, Holland, but away from them carriage by land is often expensive. It sometimes costs 50 cts. per ton per m. to take coal by land in China, while in Great Britain the cost is from 1 to 2 cts. per m. a ton and in the United States half a cent for the same distance. The coal fields in China have been laid down on a grand scale. To instance only one, that of Shansi, with from 15 to 40 seams, has a continuous field 13,500 ms. in area equal to the best Pennsylvania anthracite. There is also a rich bituminous deposit in the same province. So that in the mere carriage of coal there should be a fine future for railways outside of passenger traffic, freight trains, market produce, etc.

Work was recently commenced on the Chengchou-Kaifeng road. It seems certain that within a few mos. what now is a journey of a day and a half to two days across a sandy desert will be a matter of only a few hrs. If Kaifeng is then connected by rail with Nanking and Shantung, as it most likely will be in the near future, what used to be a journey of mos. into the far interior of China will easily be made in a day or two. While the survey between Chengchou and Honanfu to the west has been completed, as yet nothing is being said or done as to the construction of this part of the line, but it seems certain that a line passing through Honanfu and running on to Hsianfu, at least, must eventually be constructed.

It is believed that a commencement will be made with the Changchikou (Kalgan)-Kulon Railway before or at the same time as the opening of the Peking-Changchiakou Railway. It is probable that Russia will object to the Chinese building the above line, but H. E. Yuan Shih-Kai is urgently informing the Chinese Government that there is no valid reason against the carrying out of the scheme.

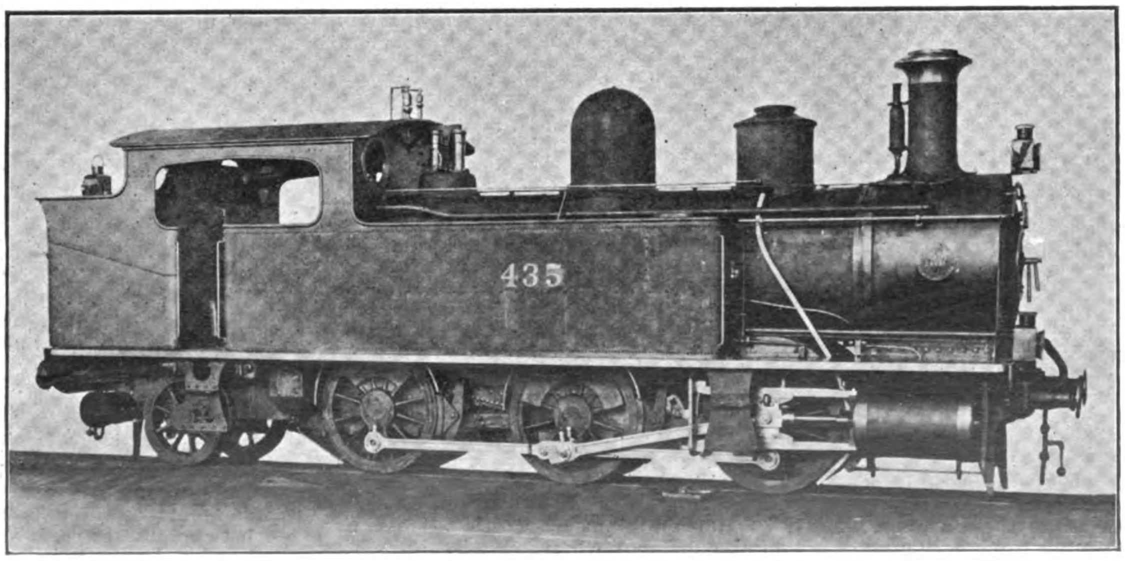
The railway through Yunnan, for which the French have obtained a concession, is progressing, but not very fast, owing to a scarcity of coolies. It is hoped in course of time to connect Yunnan with Szechuan, but the viceroy has refused to grant a concession to any foreigner. Public opinion fully indorses his views.

The Chengting-Taiyuan narrow gauge line is about finished, much to the credit of the French energy, financing, and engineering that called it into being.

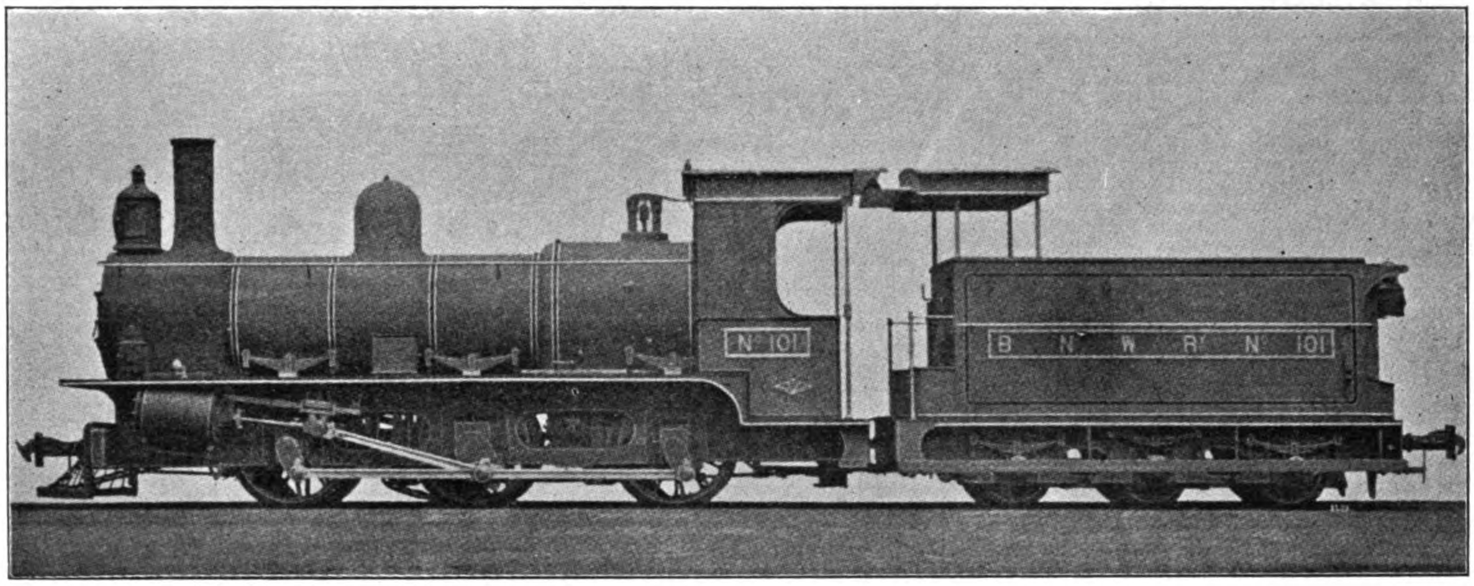
The Peking Syndicate Railway, a short, slanting line bisecting and bisected by the Luhan line, has for some months been doing the work for which it was mainly built, viz, bringing coal from the anthracite fields near Chinghua, on the border of Shansi, to Taokou, the head of navigation of the Wei River, a regular trade route to Tientsin.

RUSSIAN RAILWAY ENTERPRISE IN ASIA

A traveler who has just returned from Kulong and Kiatka and who is quoted by the Peking correspondent of the Vsahi Shimbun, gives an account of Russian enterprise in that quarter of Asia. He says that a railway between Kulong and Kiatka would have been constructed last year had not the war interfered with the project. The line will now be actively pushed. It is a branch of the Trans-Asian Railway and Russian surveyors have found a satisfactory route.



BALDWIN LOCOMOTIVE, CLASS 8-26⅓ D 7. BUILT FOR IMPERIAL GOVERNMENT RAILWAYS OF JAPAN, GAUGE 3′ 6″



(From the Indian and Eastern Engineer.)

GOODS LOCOMOTIVE, BENGAL AND NORTH-WESTERN RAILWAY, INDIA, BUILT BY MESSRS. DUBS & CO., GLASGOW. METER GAUGE

THE CANTON-HANKOW RAILWAY

A meeting of the shareholders of the Canton-Hankow Railway Company, presided over by Wong-Shiu-ping, Vice-Chairman, was held at the yamên of the late Governor of Canton on July 8th.

The Vice-Chairman opened the meeting by referring to the amount of profits contributed to the Government by the various railway companies and asked the shareholders to confirm the following suggestions:—

All profits derived from the Railway, after deducting all charges, will be divided into 20 shares to be appropriated as follows:—

1—to be paid the Government.
14—to be divided among the shareholders.
2—Reserve.
1—to holders of 20,000 shares.
1—to holders of 10,000 shares.
1—Charitable Institutions and the 72 business guilds.

The Vice-Chairman informed the meeting that all affairs were handed over on the 2nd of this moon and that the total amount collected was $8,000,000.

A petition has been sent to the Viceroy requesting him to wire for the return of Jeme Tin-you to act as Chief Engineer.

The shareholders were asked to confirm the appointment of two Inspectors-general, four auditors, and thirteen officers.

A further meeting was fixed on the 1st day of next moon.

None of the shareholders present said anything; they all listened and then left. Much dissatisfaction seemed to have existed.

THE TARLAC RAILWAY

The new Tarlac Railway, which some months ago was promoted and financed by Walter E. Olsen and other local merchants, will soon be an assured reality.

Mr. James Davis, representing the Lima Locomotive Works, closed a contract with the Tarlac Railway Company for two 30 ton locomotives and the necessary 24 rails to equip twelve and one half miles of railway line.

The order placed by the Tarlac Railway Company will foot up to over $120,000, United States currency. It has been stipulated in the contract that the rails must be laid down at Manila not later than December 1st. The locomotives are also due about this time,

The engines are known in railway parlance as "saddle backs." They are particularly adapted to the requirements of the latest Philippine railroad which for a distance of a dozen miles, taps a district populated with over sixty thousand people.

Mr. Davis has spent some time in Australia and while down there secured some fat contracts for the big Lima concern. He will leave here within a few days for Canton, where his company has been invited to bid on several large compound locomotives for the Canton-Hankow Railway now operating from Canton to Sam Shui, China.

Mr. Davis declares that he has never noted such a progressive spirit manifested in any country heretofore visited, as has been the case during his brief stay in the Philippines.

DUMMY LOCOMOTIVES SOLD:—Several locomotives, and six miles of rails, formerly used on the old Malabon dummy line, have been taken to the warehouse of the Philippine Transportation company. This material will be employed by the Insular Lumber Company in a log road through its possessions in Negros.

BRITISH LOCOMOTIVES FOR THE PHILIPPINES

An important contract for supplying eight powerful six-wheeled coupled bogie freight locomotives for the Manila Railway Company has, in the face of severe continental competition, been awarded to Messrs. Kerr, Stuart & Co. (Limited), of the Californian Works, Stoke-on-Trent. Early delivery was an important feature in the placing of the contract with British engineers, and the locomotives are to be shortly shipped to the port of Manila.

RAILWAY CONSTRUCTION IN INDIA

SIMLA, JUNE 30.

Following are the Railways under progress:—Ahmedabad-Dholka-Dhan-duki extension, estimated to cost Rs. 6,946; Ahmedabad-Paranty-Idar Road-Brahmakhed Rs. 5,501; Bengal and North-Western Benares-Allahabad (with a branch to Mirzapur) Rs. 24,960; Pertabganj-Ghoraghat Rs. 5,580; Azamgarh-Tanda Go-shaiganj Rs. 15,061; Bansdih-Manurghat-Gogra-Chandiarighat Bridge Rs. 4,546; Chapra-Mashrak Rs. 4,327; Samastipur *via* Rowsera-Sitamari-Muzafferpur Rs. 10,600; Durbhanga-Khagaria-Mohammadpur-Mozafferpur Rs. 19,070; Bengal - Nagpur - Bilaspur - Mangels - Mandla Rs. 180,910; Gurumasini Hill to Sini Rs. 21,477; Kamptee Ramtek-Tumsar Road-Katangi Rs. 31,045; Bombay Sind connection Rs. 13,500; Bombay-Baroda and Central India-Agra-Hathras Rs. 5,311; Nerbudda Valley Railway-Barwaha-Bodell Rs. 14,908; Burma-Moulmein-Kawkerick-Mywaddy Rs. 3,600; Moulmein-Wageru Railway Rs. 62,889; Pyinmana-Magwe Rs. 46,100; Southern Shan not known; Pegu Syriam Rs. 33,479: Eastern Bengal State Railway-Kissenganj-Titalia, Jalpiguri Rs. 15,599: Netrokona-Langar Bazar Rs. 15,509; Ramgya Tezpur Rs. 20,491; Forbesganj Nepal-Frontier not known.

The Great Indian Peninsular-Bellurpur Warangal (1) Western Route not known, (2) Route through the Nizam's territory Rs. 1,32,947, (3) Chord line Barichinganghat and Wardah not known; Kirpirath not known; Karur Rajapur Rs. 8,190; Kunch to the river Jumna with a branch to Madhogarh Rs.

(Continued on page 85.)

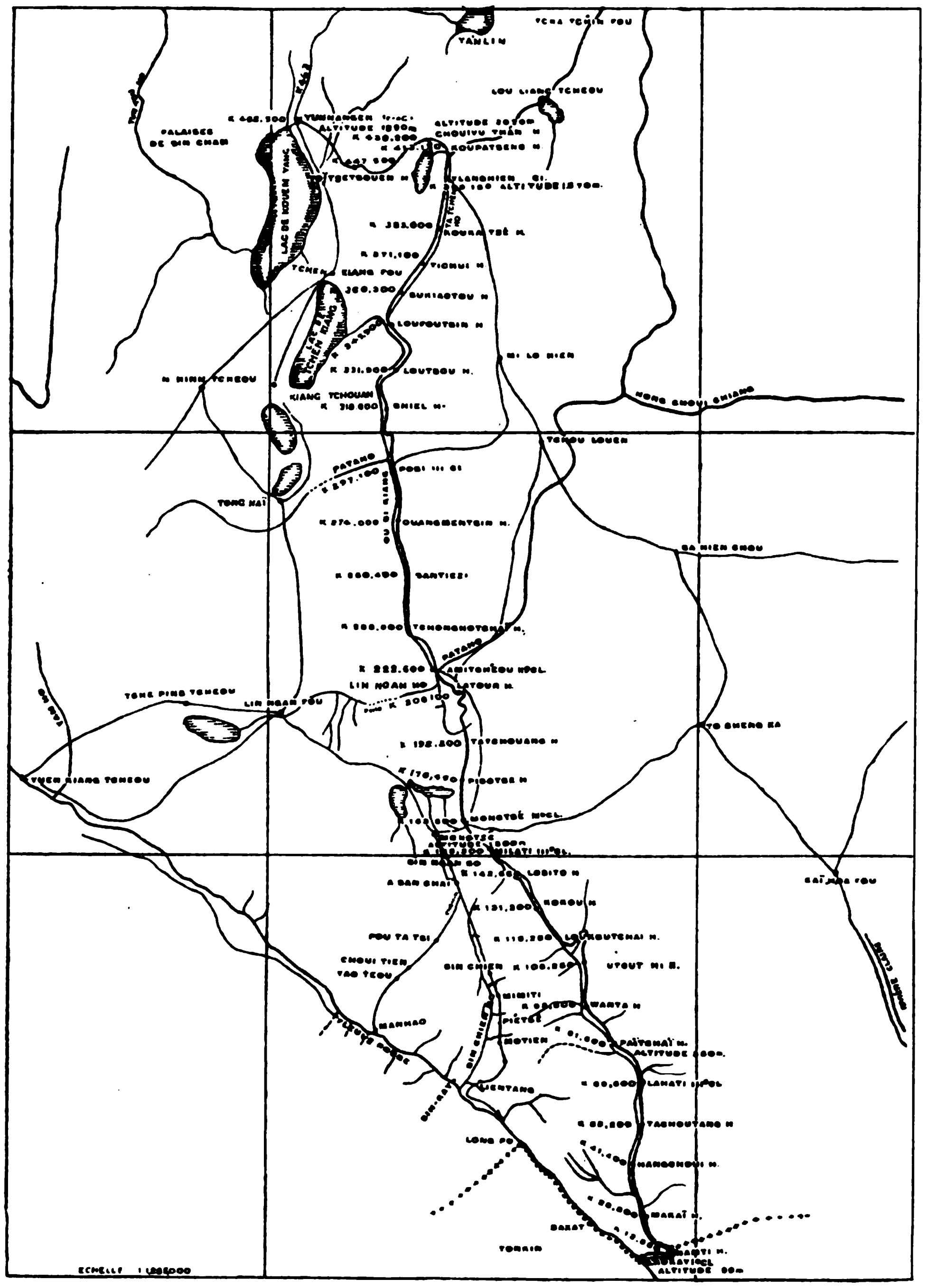
CANTON AND HANKOW RAILWAY, AT TERMINUS ON WEST RIVER

THE YUNNAN RAILWAY

Many articles and communications from correspondents about the progress of work on the Yunnan Railway and the treatment of the Chinese laborers employed by the contractors, have appeared in the press of the Far East during the last month.

The country traversed by the road is in a part of the world rarely visited by travellers and reliable information and data is difficult to secure. The least authentic information came from Mr. Little, who made the trip down to the coast from Yunnan, but his narrative is more of a descriptive nature than interesting to engineers. Probably the most reliable information on the progress of the railway is contained in the Report of Mr. J. Neumann, the Chinese Imperial Collector of Customs at the inland treaty port of Mengtsz, who submits the following interesting data to his superiors in addition to two valuable map and profile chart which were furnished him by officers of the Company.

"An important element contributing to the prosperity of the district is the construction of the railway from the Tonkin frontier to Yün-nan-fu; all along the line work is now being carried on, and as the railway in this province bids fair to become a reality, a summary outline up to date of the history of this great undertaking may be recorded. On the 9th and 10th April, 1898, an exchange of despatches took place between M. Dubail, Chargé d'Affaires of the French Republic, and the Tsungli Yamên at Peking, embodying the following Agreement: the Chinese Government concedes to the French Government, or to the French company whom the latter may designate, the right to construct a railway from the Tonkin frontier to Yün-nan-fu, the capital of this province, the Chinese Government having no further obligation than to surrender the necessary land for the line and its dependencies. These conventions are to cement and strengthen the ties of friendship which unite France and China. The French Government thereupon designated, for the construction and exploitation of the line from Tonkin to Yun-nan-fu, the Compagnie Française des Chemins de Fer de l'Indo-Chine et du Yunnan, a company which had been started by the leading financial establishments of France, and this company, in its turn, entrusted the work to the Société de Construction des Chemins de Fer Indo-Chinois. The alignment of the future railway was studied by the delegates of the French Government, and subsequently by the delegates of the Compagnie Française des Chemins de Fer de l'Indo-Chine et du Yunnan. The line is to start from Hokow, connecting there with the Tonkin line to Haiphong and its branches, and is to end at Yün-nan fu. The gauge of the line is to be 1 metre (3 feet 3 inches). Once the main line has been completed, and if the parties concerned deem it expedient, after an understanding has been arrived at, between the high provincial authorities on the one side and the French Minister and the Wai-wu Pu on the other, as to the mode of procedure, branch lines connecting with the main line may be constructed. According to the Agreement signed at Peking on the 29th October 1903 all engines (machinery), supplies (stores), and materials necessary for the construction and exploitation of the railway are to be exempt from Import Duty. The original survey resulted in a decision to follow the Red River as far as Hsin-hsien and then to continue along the valley of the Hsin-hsien River on to the Mengtsz plain; from here the line was to proceed by way of Lin-an, T'ung-hai and I-liang-hsien to Yün-nan-fu. A thorough study of this first plan revealed many technical difficulties, and, after full consideration, the company, in November 1902, submitted an alternative scheme, according to which the line is to lead from Hokow through the Nan-hsi Valley on to the Mengtsz plain, and thence by way of A-mi-chou to Yün-nan-fu. In January 1904 the French Government gave its sanction to this new *tracé*, and shortly afterwards work was started along the whole line. The total length of the line will be about 461 kilomètres. Before the French Government finally sanctioned the new *tracé*, a commission of mining engineers was sent into this province to study the question as to how far the altered project would affect the facilities for the transport of the output of the mines which, at one time or another, would be exploited; the result of their examination showed that no difference was apparent, the one project being as favorable as the other for the conveyance of the mineral products. Manifold and varied have been the difficulties of the company, and among these, notably, the scarcity of labor which prevailed at the outset along the entire line, and, in addition, the unhealthy climate in the lower region of the Nan-hsi Valley. At the time of writing, however, a great change is visible; laborers are now plentiful, and, in the much-dreaded Nan-hsi Valley, the erection of better quarters for Foreigners and Natives has vastly improved the state of affairs. There are to be nearly 100 tunnels, the longest of which will be about 600 mètres; a large number of viaducts, bridges, and galleries have to be constructed; and the whole bids fair to become a grand monument of French enterprise and genius. The line is divided into sections, which have been handed over to contractors, mostly of Italian nationality. It is hoped that in the spring of 1907 the line will be completed as far as Mengtsz, and the following year the entire line is to be thrown open to traffic.

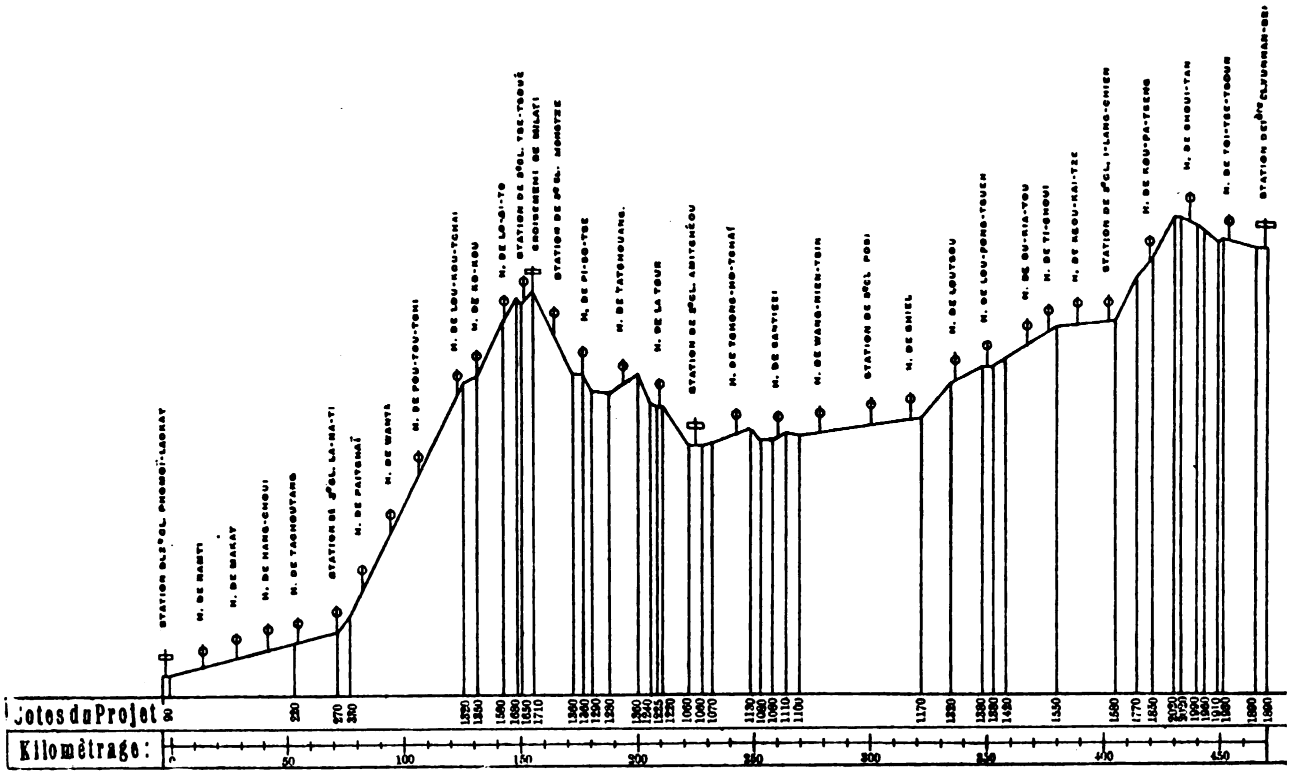


(From Trade Report of the Imperial Maritime Customs—1905.)

MAP OF THE COUNTRY BETWEEN YUNNAN-FU AND LAOKAY ON THE CHINA-TONKIN BORDER, SHOWING ROUTE OF THE YUNNAN RAILWAY

The tunnel which has to be made at Chu-yung-kwan, a pass beyond Kankao on the Peking Kalgan railway is driving the engineers mad with the difficulties it is presenting, and one of them has committed suicide. We recall the words of a famous engineer when it was first announced that the Chinese intended building the line without foreign assistance and under the direction of a prentice native engineer of the northern railway. "If......can build that tunnel, he's a cleverer man than he has hitherto proved himself."

It is now stated that a Penang syndicate has been formed to take over the Penang Hills Railway and to put it in working order.



(Trade Report of the Imperial Maritime Customs)

PROFILE OF THE COUNTRY BETWEEN YUN-NAN-FU AND LAOKAY.

RAILWAY CONSTRUCTION IN INDIA

(Continued from page 83.)

5,759; Kurlatrombay Rs. 1,138; Murtazapur-Pesgaon Rs. 14,022; Jodhpur-Bikanir, Borawar Hissar not known; Madras Dharmapuri *via* Palakedu to Krishnagiri and from Palakedu to Bangalore Rs. 18,778; the Nizam's guaranteed. Wadi Kophal not known; North-Western Jhang Sangla Rs. 17,190; Lodhran Khanewal Rs. 3,045; Shorkot road Chichoki Rs. 35,575; Khanpur Chackran Rs. 5,752: Patiala Jakhal Rs. 9,534; Aohtak Bhewan Rs. 5,752; Oudh and Rohilkhand, Balaman Sitapur Rs. 10,807; Rosa Bokharpur—not known; Bokharpur-Sitapur—Rs. 7,422; Cawnpur-Rae Bareli Rs. 18,733; Rohilkhand and Kumaon; Philibhit Barmdeo (re-survey) Rs. 8,980. South Indian Madras Beach to Palavaram doubling Rs. 21,200; Pullachi-Palghat Rs. 17,750; Terruturipundi to Vedaraniyam not known; Southern Mahratta Gadag-Nalvigi Rs. 14,371; Satora Road-Satara City Rs, 5,000.

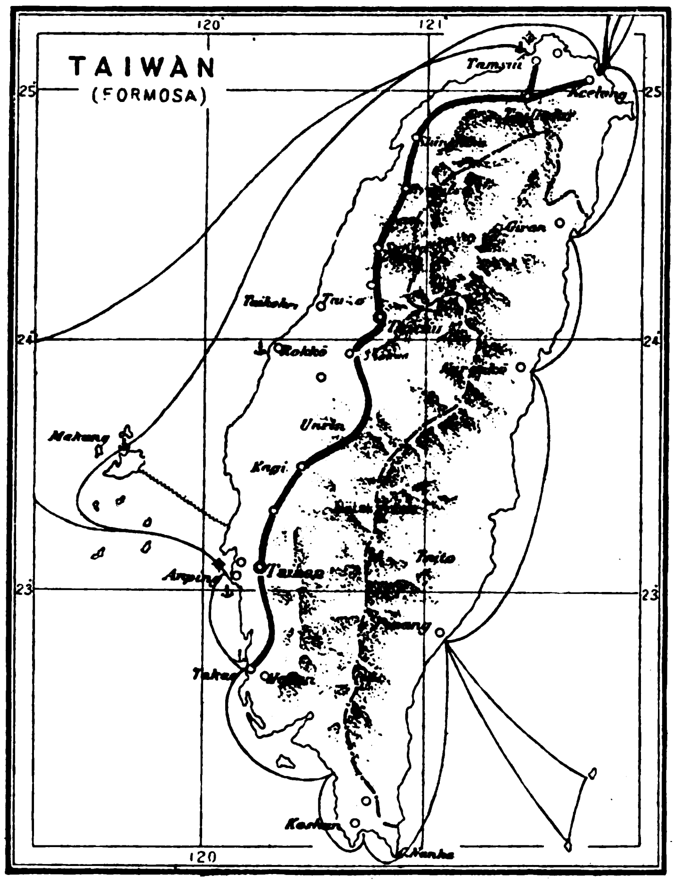
(Bengalee)

FORMOSA GOVERNMENT RAILWAY

With the exception of about nine miles between Hakkoko and Koroton, where some extensive bridging work still remains to be done, the line connecting Kelung in the north and Takow in the south is complete. The journey between the capital Taihoku and Tainan, the largest city in the south, can now be accomplished in 14 hours, including the time spent in getting from Hakkoko to Koroton by trolley. The railway authorities therefore contemplate erecting a good foreign hotel at the capital, for they consider that if only suitable accommodation were provided for travellers, many of them, now that communication between north and south is easy, might make a visit to Formosa, which, beautiful and interesting though it is, has so far failed to attract the globe trotter and the money that he leaves behind him. During 1906 work will be commenced on the bridges that remain to be constructed, and they should be completed in about two years' time. Okura and Co., a Japanese firm, were the successful tenderers for the supply of most of the bridging materials, which will come from the United States.

SHANTUNG RAILWAY

The Shantung Railway Company reports that in 1905 the traffic showed a sufficient development, while in 1904 there was an average weekly traffic of 10,748 passengers and 4,695 tons of goods, for 1905 there were 15,452 passengers and 5,971 tons of goods. In 1905 the total traffic amounted to 803,527 passengers (558,868 in 1904) and to 310,482 tons (179,270). Among the goods coal takes the first place with 158,115 tons in 1905 and 68,921 tons in 1904. Also it may be mentioned that of agricultural produce from the interior, and as beans, oil, cotton, earthenware, straw plaitings, etc., continually larger quantities are transported. The financial result has been an income of 1,912,296 Mex. dollars, against 1,246,047 Mex. dollars for 1904. After writing off m.50,000 on stocks, and after giving m.300,000 to renewal purposes there remains a net profit of m.2,063,572, out of which m.103,179 are applied to special reserve, while m.1,755,000 are distributed as a dividend of 3¼ per cent. on the paid-up share capital of m.54,000,000.



MAP OF FORMOSA, SHOWING COMPLETED RAILWAY SYSTEM.

F. A. MOLLITOR, C. E.

THE SUPERVISING RAILWAY EXPERT TO THE GOVERNMENT OF THE PHILIPPINES

The position of supervising railway expert was created by an Act of the Commission, dated June 29th, ulto., to give official recognition to the appointment of F. A. Mollitor, C. E., some time in January of this year.

The construction of the new roads and the difficult task of drawing up equitable specifications for the formal contracts, and the many complex technical questions naturally arising during the period of construction, necessitated the services of a high class expert to represent the Government. In addition to the practical experience of constructing, equipping and operating a railway, the post called for a man of executive ability and one thoroughly conversant with the financial phases of the undertaking. Such men are difficult to secure in the United States, where they command salaries commensurate with the importance of the position, and to secure the right man for the Philippines, it was necessary to offer such inducements. It was some time before the Secretary of War discovered and secured the right man for the place.

Mr. Mollitor was at the time Chief Engineer of the Choctaw System, with headquarters at St. Louis. His past experience in building roads throughout the West and Southwest gave him the required experience and qualifications to represent the Government for the work in the Islands.

The importance of drawing up the preliminary drafts of the contracts and the adjustment of the many points to the mutual satisfaction of the Government and contracting parties was a work calling for great skill and diplomacy, and the success which finally crowned this preliminary phase of the negotiations was due largely to Mr. Mollitor, who was in Washington for several months acting as adviser to the War Department before coming to the Islands.

The full text of the Act creating the position for Mr. Mollitor and ratifying his appointment is as follows:

By authority of the United States, be it enacted by the Philippine Commission, that:

SECTION 1. There is hereby created as of December ninth, nineteen hundred and five, in the Department of Commerce and Police, the position of Supervising Railway Expert at a salary of twenty-four thousand pesos per annum. The Supervising Railway Expert shall be appointed by the Governor-General, with the advice and consent of the Philippine Commission.

SEC. 2. The Supervising Railway Expert shall be supplied with an office by the Director of Public Works, who shall assign to him from the force authorized by his appropriation such stenographers, clerks, assistant engineers, draftsmen, and other employees as he may require and as may from time to time be authorized for that purpose by the Philippine Commission.

The salary of the Supervising Railway Expert shall be paid from the Insular salary and expense fund or from any appropriation specifically providing therefor. His proper contingent expenses and those of the employees assigned to him shall be paid from the appropriations of the Bureau of Public Works.

SEC. 3. The Supervising Railway Expert shall keep an account of the nature and cost of the service which he and the employees assigned to him perform in order that the Government may be in position to make a charge against any railroad constructed under guaranty, as in the instance of the Philippine Railway Company in article nine of section one of Act Numbered Fourteen hundred and ninety-seven.

SEC. 4. It shall be the duty of the Supervising Railway Expert—

(a) To advise the Secretary of Commerce and Police in regard to any concession or extension of concession if they be asked for by companies, firms, or individuals proposing to construct railroads in the Philippine Islands, whether the traction is by steam, electricity, or other motive power.

(b) To supervise the construction and operation of all railroads being constructed or operated in the Philippine Islands with a view to seeing that they comply with the terms of the concession from which they receive their privileges and with the laws of Congress and of the Philippine Islands governing such enterprises.

(c) To supervise in particular the construction of railroads upon which interest of bonds is guaranteed under authority granted by the terms of the Act of Congress approved February sixth, nineteen hundred and five. It shall be his duty to determine the nature and quality of all expenditures and to see that they comply with the terms of their respective concessions in all respects, and no bonds shall be issued or certified as provided in section four of the Act of Congress approved February sixth, nineteen hundred and five, until written certification is made to the Governor-General through the Secretary of Commerce and Police by the Supervising Railway Expert that he or his duly authorized representative has examined the line upon which such bonds are to be issued and the books and accounts of the company and that the construction has complied in every way with the terms of the concession: *Provided, however*, That if the Supervising Railway Expert and the officers of the railway company in question differ as to the proper allowance to be made in regard to any piece of construction, the Governor-General may, after due hearing of both sides, determine the proper amount of bonds which may be authorized, and in that instance he may certify to such bonds without previous certification by the Supervising Railway Expert.

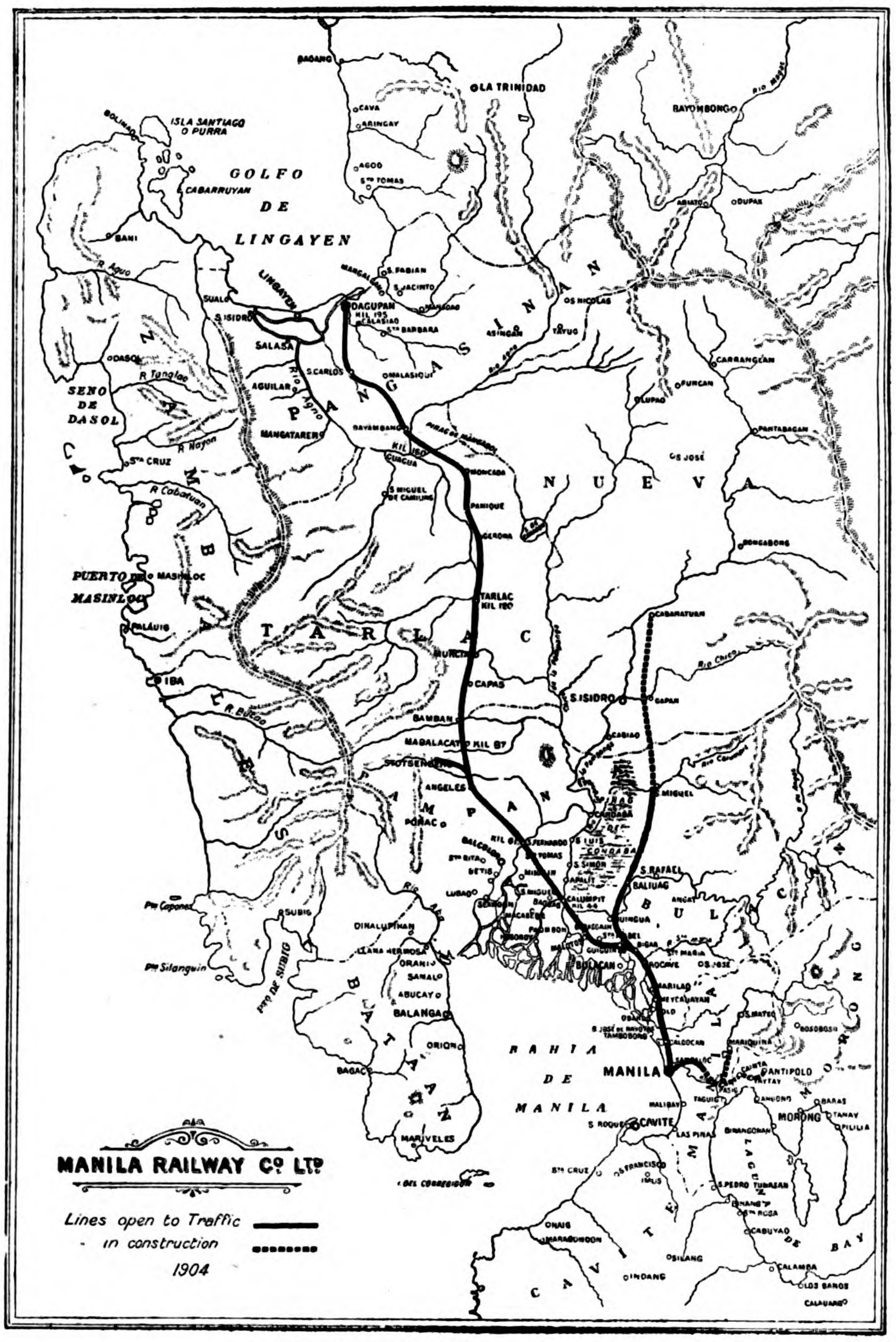
(d) He shall examine the operation of all railroads operating under guaranty of interest authorized by the Act of Congress approved February sixth, nineteen hundred and five, with a view to determining the real cost of operation, and in the event that any company makes a claim for payment of guaranty of interest under representation that it has failed to earn the amount necessary to pay interest on the bonds, after proper examination of the operating accounts he shall send a report of the same to the Secretary of Commerce and Police and to the Insular Auditor with a certificate that he has so examined the accounts and found the representations of the company to be correct and the money to be paid under the guaranty to be properly due; or if he does not find the representations of the company to be correct he shall report the difference, showing what, in his judgment, is the proper deficit, if any, and the amount which he has found to be due by the Government toward the interest of these bonds.

(e) He shall examine annually or oftener the operations of all other railroad companies in the Philippine Islands in such detail as may be required by the Secretary of Commerce and Police, and shall render to the said Secretary a report of their earnings and operations for the purpose of an exhibit to the annual report of the Philippine Commission, and shall furnish such other reports and exhibits and make such other examinations as may from time to time be required by the Secretary of Commerce and Police.

(f) He shall advise the Governor-General upon all points which require determination by the Governor-General under the terms of any Act or concessionary grant or franchise to construct or operate railroads in the Philippine Islands.

SEC. 5. The Supervising Railway Expert shall be the agent of the Governor-General and of the Secretary of Commerce and Police to make all investigations required of them by the terms of any Act or concessionary grant to a railroad, except as hereinafter provided. He shall have power to look into and examine any books and accounts, vouchers, records, or other information to which under the terms of the law the Philippine Government has access: *Provided*, That nothing in this Act shall be construed to exclude the Auditor for the Philippine Islands from examining from time to time, in his discretion or when requested to do so by the Governor-General, the books, records, accounts, and vouchers of any railroad company or corporation

MAP OF LUZON, SHOWING THE ORIGINAL RAILWAY SCHEME, AS SURVEYED BY NORTON AND DREW, AND ACCEPTED BY THE GOVERNMENT



PRESENT MANILA RAILWAY SYSTEM

organized or operating in the Philippine Islands *And provided further*, That the Governor-General or the Secretary of Commerce and Police may at any time designate in writing any other official to be his agent to make any examination or perform other duties in connection with the supervision of railroads.

SEC. 6. The Supervising Railway Expert shall be entitled to such leave of absence or commutation thereof as may be determined by resolution of the Philippine Commission.

SEC 7. The public good requiring the speedy enactment of this bill, the passage of the same is hereby expedited in accordance with section two of "An Act prescribing the order of procedure by the Commission in the enactment of laws," passed September twenty-sixth, nineteen hundred.

SEC. 8. This Act shall take effect on its passage.

Enacted, June 29, 1906.

THE PHILIPPINE RAILWAYS

The final contracts for building a system of railways in the Philippines have been signed, and work already commenced. The contracts involve the construction of several hundred miles of track and the expenditure of about $30,000,000, most of it within the limits of the islands. The original project will be followed very closely with a view to the development of the great natural resources that are now inaccessible, as well as providing suitable transportation facilities for those sections which are most thoroughly settled and cultivated.

Contracts for about 400 miles of track in the Island of Luzon have been signed by James Speyer and Co., the well-known bankers of New York for the Manila Railway Co. of New Jersey, and 300 miles of track in the Islands of Panay, Negros and Cebu have been signed for by J. G. White and Co. of New York, representing a syndicate incorporated under the title of the Philippines Railway Company, and composed of that firm, Chas. M. Swift of Detroit, Cornelius Vanderbilt of New York, Mr. Wilson, president of the Lincoln Trust Company, New York, Heidelbach Ikelheimer and Co., and the International Banking Corporation.

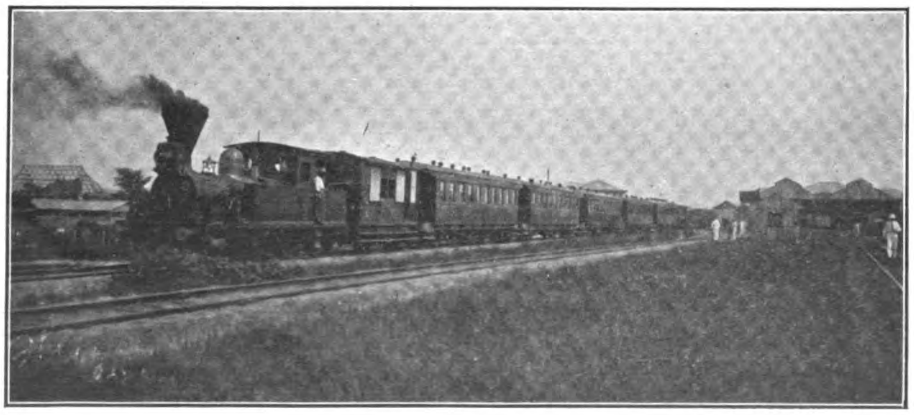
The Manila Railway contract carries no subsidy, but a perpetual franchise. The Philippine Railway Company also has a perpetual franchise, and the government of the islands guarantees 5 per cent interest upon 95 per cent of the actual cost of construction for a term of thirty years.

The government will be represented in the construction by F. A. Mollitor, formerly chief engineer of the Choctaw railway in Oklahoma and Indian Territory. The Manila Railway will continue to be represented by their old manager Mr. H. P. Higgins, who has so successfully conducted their affairs in the past. The chief engineer for J. G. White and Co. will be Mr. Edward J. Beard, who has had twenty-five years' experience in the location of important railways throughout the west and south. He was at one time a contracting engineer and built the street and suburban railways of Meriden, Miss., in 1890, then became chief engineer of the New Orleans and Northwestern road, and in 1894 was engaged in the construction of the Kansas City, Pittsburg and Gulf railroad. In 1895 he built the Gila Valley, Globe and Northern railroad of Arizona, and in 1897 the railroads of the Boston and Montana Copper Company in Arizona. In 1902 he was appointed assistant chief engineer of the Rock Island system, and held that position until he resigned to take charge of the construction of the new roads in the Philippines.

In the construction of the railroads in Cebu, Panay and Negros Mr. Beard will be assisted by Mr. Lawrence E. Bennett, an engineer of wide experience in the East. He was formerly general superintendent of the famous Oroya railroad in Peru and built a division of that road which is notable for being the most elevated piece of railroad construction in the world, crossing the Andes at an altitude of more than 15,000 feet. Mr. Bennett spent several years in Siam, where he built the Korat railway and was consulting engineer for that government in other public works.

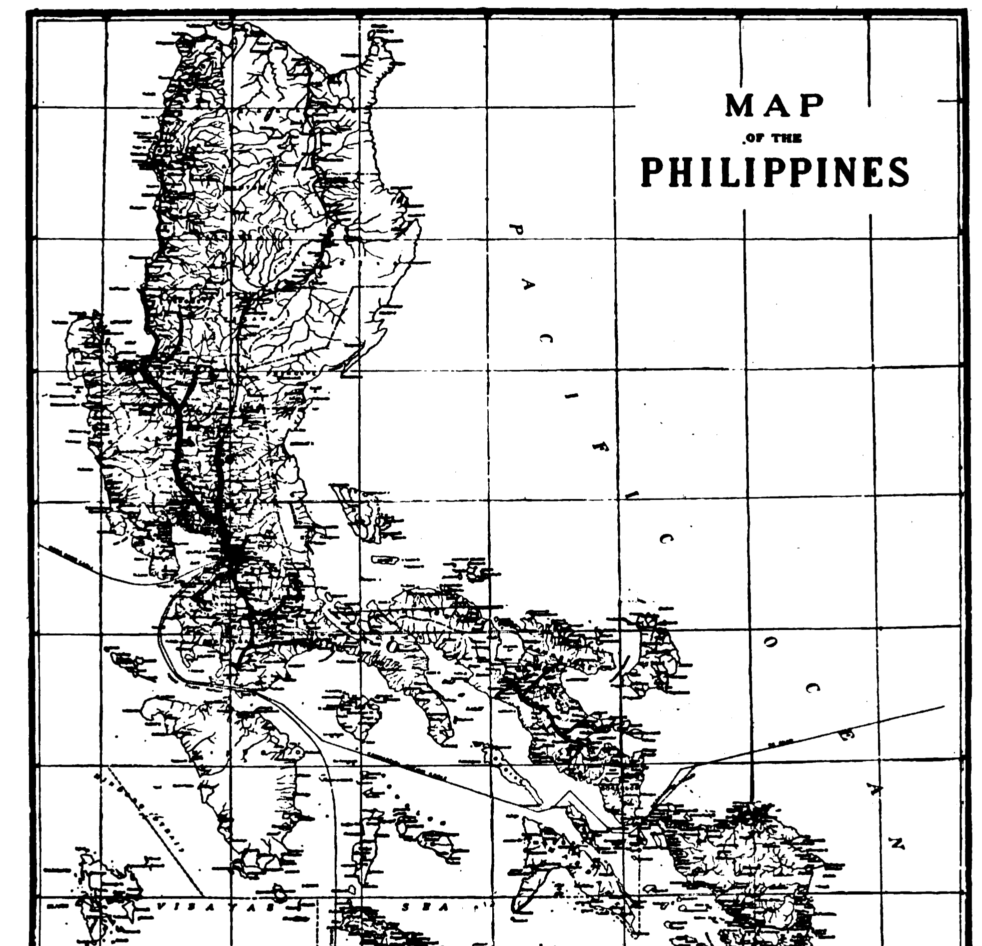
The railroads to be built by J. G. White and Co. will involve an investment of something like $11,000,000.

Speyer and Co. refused to bid on the basis of the original government plans and speci-



Courtesy "Daily Bulletin"

MANILA AND DAGUPAN TRAIN LEAVING STATION



Courtesy "Daily Bulletin."

MAP OF PHILIPPINES, SHOWING VARIOUS RAILWAY PROJECTS

fications as advertised, according to the map shown in this article, but tendered a modified proposition, which was accepted by Secretary Taft and will be carried into effect. Speyer and Co. control the Manila Railway Company, an English corporation which owns the only railway in the archipelago, from Manila to Dagupan, under a franchise continuing for eighty years, but to comply with the requirements of the contract the Company has been incorporated in New Jersey. They are building several branches of feeders to the existing line, aggregating about seventy-five miles, under a concession from the Philippine government and proposes to extend the present tracks from Dagupan seventy-five miles to the town of San Fernando, and build a branch twenty-five miles long to the foot of the mountains in which Benguet, the summer capital of the Philippines, has been located. The government wanted Speyer and Co. to continue this line up into the mountains of Benguet, but they declined to do so on the ground that it would furnish business for only about six months in the year, and therefore could not be profitable. The Benguet wagon road, constructed by the government from the proposed terminus, will be used for lines of stages to the summer capital.

The Manila Railway Company will also build a road seventy miles long from the city of Manila to the town of Batangas, and two branches therefrom, one to Santa Cruz, a distance of twenty-five miles, and the other to the town of Lucena, a distance of thirty-five miles, making a total of 130 miles. They also agree to build a line from Pasacao through Nueva Caceres to the town of Ligao, thence to Tabaco and thence to Legaspi, the main line and branch being approximately 100 miles. They will also be given additional franchises for half a dozen feeders to their road already constructed, and to those which they propose to build, and which are not included in the original project of the government.

This company receives no subsidies. They have sufficient confidence in the success of the proposed roads to construct them without assistance. At first they demanded a guarantee from Secretary Taft that no franchises will be granted to any other person or corporation to parallel the lines which they propose to build, but that condition was refused. The government of the United States does not grant monopolies, but Secretary Taft felt perfectly willing to give Speyer and Co. an assurance that their interests would be protected from unfair competition as long as the management of their road received the approval of the government and was satisfactory to the people. Furthermore, Speyer and Co. have been assured that additional franchises will be granted them for roads in other parts of the Island of Luzon without subsidies or guarantees whenever they are ready to build them.

The railways thus provided for will bring the most important agricultural, mineral and timber resources of the Philippines within easy distance of Manila and will furnish the planters of the three other important islands facilities for carrying their crops to market. It is the first important step in the material development of the islands, and will contribute very largely to their prosperity.

FROM THE NATION, NEW YORK,

May 17th, 1906

It is a pleasure to note at last one American periodical in the Philippines which is not an organ of truculent jingoism or an exponent of general cheapness. The American newspapers and weeklies of Manila have been of this sort or have had a very ephemeral existence. But the *Far Eastern Review*, published at Manila by an American and devoted to engineering, commerce, and finance in the Orient in general, is a monthly publication of more solid character. The January number, for instance, has as its leading illustrated article an excellent description of the construction of the Canton-Samshui branch of the Canton-Hankow Railway, an enterprise which is of great importance for the development of southern China. The recent construction of large public works in the Philippines, especially in Manila, appears to have given the occasion for the publication of such a periodical, whereas other American periodicals in the Philippines have mainly had their foundation in soldier-domination. The February number of the *Review* contains, besides some interesting news as to Philippine railway construction and illustrated material upon public improvements in Manila, a very enlightening contribution upon the already important and growing shipyards of Japan, and articles upon water-power electric plants in Mysore, India, and timber tramways in Madras. The Japanese, it seems, have taken over the English technical terms for shipbuilding as well as on board their steamships.

PUBLIC WORKS AND INDUSTRIAL PROGRESS OF HONGKONG, 1905.

Hon. W. Chatham, Director of Public Works, in his annual report, published in the Gazette, has the following to say concerning the progress of important industrial undertakings and public works in the Colony:—

The Naval Yard Extension and Messrs. Butterfield & Swire's Shipyard Works were in progress throughout the year. In the case of the former, the reclamation, outer quay wall, and tidal basin were practically completed and substantial progress was made with the construction of the graving dock. Several of the buildings connected with the scheme were in progress, some delay being caused in the case of the pump-house by the failure of the timbering just as the excavation for the pump-wells, about 70 feet in depth, was nearly completed. In the case of the Shipyard Works, the reclamation and levelling of the site made good progress, and the inner portion of the graving dock was completed; work on the entrance, for which a very heavy cofferdam was required, being in active progress by the close of the year.

COMMERCIAL SQUARE.

The remaining large blocks of buildings on the Praya Reclamation, east of Pedder Street, including "Hotel Mansions," "King's Building," "York Building" and "Royal Building," were completed during the year. A great many of the leading firms of the Colony—business, commercial and professional—are now housed in these and other buildings occupying the area indicated. The buildings have an imposing appearance and compare favorably in many respects with similar buildings in our large home cities.

HOSPITALS AND FLOUR MILLS.

Other works worthy of mention are Sharp's Memorial Hospital, Mount Kellett, and the new Military Hospital above Bowen Road, both of which were nearing completion at the close of the year. Work was begun on the erection of the buildings to form the premises of the Hongkong Milling Co., in Junk Bay. The Star Ferry Co.'s new pier, opposite the end of Salisbury Road, Kowloon, was constructed during the year and was nearly ready for traffic. It will afford a much more convenient point of arrival and departure than the old pier, both for the ferry steamers and for passengers and vehicles, being clear of the Kowloon Wharves with all their obstructions afloat in the way of cargo-boats, lighters, etc., and ashore in the way of rails, trucks and masses of cargo constantly being moved to and fro. The new pier also affords much better accommodation and protection from the weather than the old one.

RECLAMATIONS.

The reclamations at Kowloon and Blackhead's Point and of Kowloon Marine Lot 83 at Hunghom, mentioned in last year's report, were practically completed, whilst those of Marine Lot 285, at North Point, and of Kowloon Marine Lot 85, at To Kua Wan, made good progress. The following further reclamations were in progress:—

	Area, sq. ft.
New Kowloon Marine Lot No. 2. Lai Chi Kok	345,928
Kowloon Marine Lot No. 87, Yaumati	145,350
Sai Kung Marine Lot No. 2, Junk Bay	653,400

The areas stated are those of the lots, which, in two cases, extend for some distance above old high-water mark and, though largely so, are not therefore exclusively reclaimed from the sea. In the remaining case, the purchaser has been required to fill in and reclaim a considerable area of Crown foreshore in addition to the entire area of his lot.

LAW COURTS.—Here also great difficulty was experienced in obtaining a supply of granite, especially during the earlier part of the year, with the result that the progress of the work was slow. Owing to the numerous granite arches extending from the pillars of the colonnade to the main walls, it was not possible to proceed with the brickwork above the level of the first floor until these had been built and every effort was therefore made to get the granite-work pushed on. It may be mentioned that each of the stones in the pillars of the colonnade weighs from 2½ to 3¼ tons and much careful dressing is necessary to adapt them for setting in the work.

Much of the steelwork and concrete forming the first floor were laid early in the year, the internal walls having then reached such a level as to admit of this being done. By the close of the year nearly all the external walls were completed to the same level, the pillars of the colonnade were built to an average height of 16 feet and some of the arches were in progress.

The average number of masons employed daily was 124. In addition to the stone set in the work 126 granite balusters were prepared, bringing the number of these ready for fixing up to 200.

POST OFFICE.—The contract for the foundations was nearly, but not quite, completed, completion being delayed by the undertaking of additional work. One of the principal items was the covering of the entire area of the basement with asphalte, which was also carried up the outside of the main walls, so as to prevent the percolation of tidal or subsoil water into the basement rooms, which are to be used for the storage of mails, etc. The asphalte was laid on a layer of lime concrete 12 inches thick and was covered with a layer of cement concrete, 6 inches thick, the thickness of the asphalte being ¾ inch. It was also decided to make provision for a clock tower in the building and this necessitated some alterations and additional work in connection with the foundations. The addition of these items has considerably delayed the completion of the contract. The total number of piles driven has been 1,808 of an average length of 44ft. 6.

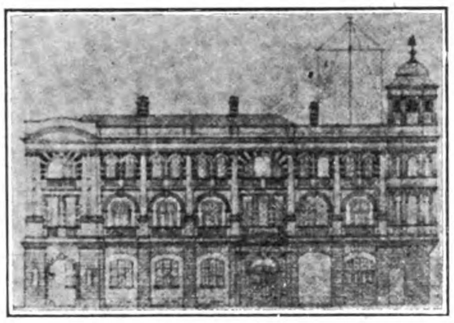
A contract for the superstructure was entered into with Messrs. Sang Lee and Co. on the 1st August. A quarry from which suitable stone could be obtained for the work was selected at Ngau Tau Kok, in New Kowloon, and a considerable amount of preparatory work was carried out to enable a good supply to be obtained, a quantity of roughly-squared blocks being in readiness to transport to the site when it became available. Some brick and plaster models of the principal parts of the stonework were also prepared.

NEW HARBOR OFFICE, HONGKONG

An event of considerable importance and interest to shipping circles and the business community generally took place on the 16th ulto., when His Excellency the Governor, Sir Matthew Nathan, K. C. M. G., opened to public business the new Harbor Office, just completed on the Praya East, near the Canton wharf.

His Excellency the Governor said, when it was suggested to him that some formal ceremony should take place at the opening of this office, he was very pleased to fall in with that suggestion, and he had come down to tell those present a few facts about the building. A committee was formed, ten years ago, to look after the condition of the public buildings of the Colony, and one of their recommendations was a proposal for building a New Harbor Office. Some time elapsed, but in 1901 the contract for the building in which they stood was given out, and foundations laid without further delay. The cost of the building, according to the contract, was to be £15,000, and the plans and specifications were carried out under the capable supervision of Mr. Fisher, who was ably assisted in the work by Mr. White. The building was an extensive one and contained the Harbor Master, and Assistant Harbor Master's offices, Boarding Officers, shipping, import and export department, Marine Courtroom, examination room, telegraph room, and rooms for the boatmen and watchmen. In addition to these there was a watchtower commanding an uninterrupted view of all that went on in the harbor. The design for the building was drawn up by Mr. Fisher, the Government Architect.

(*Hongkong Telegraph.*)



NEW HARBOR OFFICE, HONGKONG

SHIP-BUILDING IN JAPAN

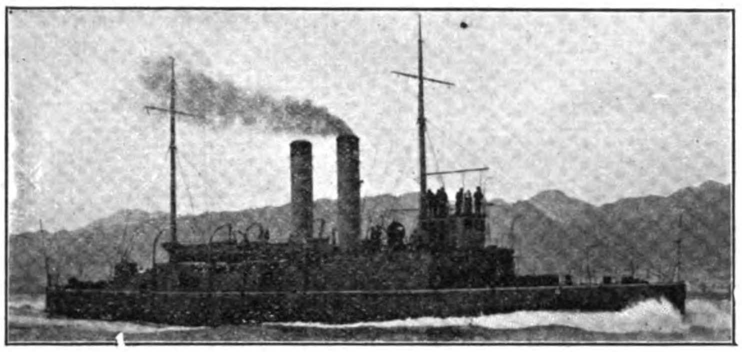
REMARKABLE PROGRESS.

Mr. Uchida, Director of the Shipping Bureau, who has recently returned to Tokyo from a tour of inspection of shipbuilding and dockyards in the Kwansai and Kyushu districts, in the course of an interview with a *Jiji Shimpo* representative, remarked:—

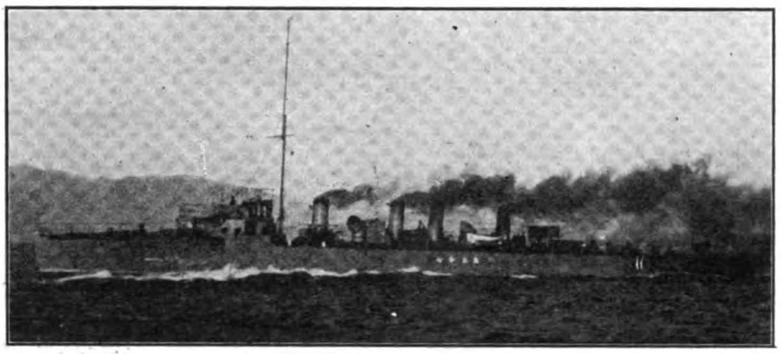
"The war has given a great impetus to the ship-building and dockyard industry, which has made remarkable progress during the last few years. The principal ship-building yards I have just visited are the Osaka Iron Works, the Kawasaki Yards at Kobe, and the Mitsu Bishi Yards at Nagasaki, and all three are full up with orders. The total area of the premises of the Osaka firm is about 40,000 *tsubo*, and about 4,000 men are employed; the Kawasaki Yards are larger than those at Osaka, their factory area being more than 60,000 *tsubo*, and the number of workmen employed 8,000. The Mitsu Bishi Yards are, however, the largest in the country, covering some 100,000 *tsubo* of land, and employing over 10,000 men. These shipbuilding yards, however, find their capacity inadequate to meet growing requirements, and are steadily engaged in extending their works.

"The factory arrangements have much improved since I made an inspection a few years ago. The building of torpedo-destroyers is quite a new feature. Already one of these has been launched at Osaka, four at Kobe, and two from the Mitsu Bishi Yards. The construction of gun-boats for the Chinese government is going on at the Kawasaki Yards, two of them having already been launched. The building of ships of over 10,000 tons in Japanese yards is now quite common. In the Mitsu Bishi Yards, for instance, a ship of 13,000 tons is being built for the Toyo Kisen Kaisha, in addition to a ship to take the place of the *Hitachi-maru* which was destroyed by the Russians during the war.

"Work in the smaller yards has also greatly increased since the war. The small ship-yards on both banks of the Kidzugawa have hitherto devoted their attention to the building of wooden vessels of 200 to 300 tons, but these are now able to build iron ships of 800 tons. The Matsuo Yards at Kayokijim outside, Nagasaki Harbour, which have hitherto been engaged only in repairing work, are fast developing into a complete ship-building yard. At Innoshima, Bingo, there are two dockyard companies, one of which possesses two dockyards measuring 300 ft. and 364 ft. respectively, while the other has a yard 410 ft. in length, and is about to open another measuring 300 ft. At Nochi and Kinoe there are two ship-building yards, each possessing a dockyard 200 ft. in length. Kinoe-mura



H. I. C. M'S GUNBOAT "KIANG-YUAN," 1905. SPEED 14.8 KNOTS. ONE OF FOUR SISTER SHIPS BUILT AND ENGINED BY THE KAWASAKI DOCKYARD COMPANY, LTD.



H. I. J. M'S TORPEDO-BOAT DESTROYER "ASAKAZE," 1905. SPEED 29.67 KNOTS. ONE OF FIVE SISTER SHIPS BUILT AND ENGINED BY THE KAWASAKI DOCK YARD COMPANY, LTD.

has long been known as a centre of wooden ship-building, and the launching a of ship of from 70 to 150 tons is an almost daily occurrence.

"The largest dock in Japan is the Mitsu Bishi, which measures 728 ft., the next being the Yokohama Dock Company with a dock of 552 ft., the third largest belonging to the Hakodate Dock Company, being 534 ft. long. The floating dock, owned by the Mitsu Bishi Company, is 412 ft. in length and is capable of floating a dead weight of 7,000 tons. Another and larger floating dock is now being built by the same company. The docking business, like the ship-building, is now in a very prosperous condition.

"The technical knowledge of ship-building amongst the Japanese has also made much progress, compared with eight or nine years ago, when the *Hitachi-maru* 6,000 tons, was built. At that time the engineers and mechanics experienced much difficulty in building the steamer, but now they are able to build larger vessels with greater ease and expedition. What is necessary in Japanese ship-building is the further sub-division of labor amongst the departments of the industry. If this is done ship-building can be executed with more dispatch and promptitude than is at present the case. There is scarcely any doubt that with the development of the ship-building industry in Japan orders from foreign countries will increase."

HONGKONG SHIPBUILDING

Messrs. Wilks and Jack have placed the order for four light-draught steel stern-wheel steamers with the Hongkong and Whampoa Dock Company.

The vessels are intended for the subsidized mail service in Tonkin, lately adjudged to the Maison Roque in Haiphong in place of Marty et d'Abbadie, whose agreement terminates in December next, and the new contract calls for an entirely new fleet of steamers.

They are 146 ft. in length and 26 ft. beam over all, with a draught of water of 24 in.

The first steamers for the fleet of the Fluviales were constructed in Hongkong in 1887—three by the Dock Company, and two by Fenwick and Co., to the order of Marty et d'Abbadie, and to the plans of Mr. W. C. Jack, their superintendent engineer. The fleet was increased yearly afterwards by light-draught steamers built in Haiphong, until in 1898 there were upwards of 22 vessels running a very complete mail and passenger service. Since the advent of the railways the importance of the business has steadily declined, and, since the death of M. d'Abbadie, the organizer, has been run by Mr. A. R. Marty.

The Maison Roque, who succeed the present Fluviales, is one of the oldest firms in French Indo-China, having for many years run the Messageries Fluviales of Saigon, and one of the first steamship lines between Hongkong and Haiphong.

The contract for the subsidiary lines on the higher reaches of the rivers above Hanoi has been given to the Union Commercial Co., of Indo-Chine, of Hanoi.

This company have had two light-draught steamers of the same type, supplied through Messrs. Wilks and Jack, within the past three years, one being built at Portland, Oregon, the other at Cosmopolitan Dock.

(S. C. Morning Post)

JAPAN'S DEVELOPMENT

Consul General Henry B. Miller furnishes from Yokohama some Japanese industrial news of considerable interest, as follows:

Fish Tinning

The remarkable development of the fish-tinning industry in Japan, as the result of the war, is beginning to attract the attention of foreign capitalists. An American gentleman who recently arrived in Japan has been in communication with Baron Kuki, an imperial court councilor, with the object of investing in the industry and exporting to America. It is stated that crabs and lobsters are best suited for exportation. The industry is very promising.

Meat Tinning

Owing to the large increase of the business of the Japan Meat Tinning Company, of Nagoya, the working capital, paid up to the amount of $62,500, has proved insufficient, and the company has decided to call another $62,500 from shareholders.

Cotton-yarn

Cotton-yarn prices have fallen off, and the yarn exports declined 20,000 bales for the first three months of 1906, as compared with the first quarter last year; but the home demand consumed 37,000 bales more, hence the spinners increased their sales 17,000 bales. Moreover, the future outlook of the export trade is good, while a brisk demand is anticipated in the home market with the carrying out of the rewards to the war veterans.

Spinning Companies

The smaller spinning companies are being steadily absorbed by the larger concerns. The Kanegafuchi has merged all the mills in Kyushu. Mills in Okayama prefecture are now contemplating incorporation, while many smaller ones in Osaka have already done so. The Mie Spinning Company has succeeded in absorbing the mill in Aichi. The cost will be defrayed out of the reserve fund. It is generally believed that the spinning mills in Japan will be incorporated into three or four great concerns in the course of a few years.

The working of the Settsu Spinning Company, of Osaka, for the past six months has been very satisfactory. The company has sold 5,000 bales at $62 to be delivered up to January next. The net profit for the half year is estimated at $500,000 gold, the largest profit ever made. A site for another factory of 30,000 spindles is being chosen, and the company has decided to extend its third mill in Kizu-mura. Water power from the Kizu River will be utilized.

Railroads

Another scheme is on foot to construct an electric railway between Osaka and Nara, with a capital of about $1,000,000. It is anticipated that electric railways will be running parallel with all the principal railway lines in the course of a few years.

The Minomo-Arima Electric Railway Company, capital $2,500,000, has been formed to build a double-track line between Osaka and Ikeda and on to Mina, the maple resort, and Arima. Other new projects are from Takarazuka to Mikage via Nishinomiya, and also from Iguchido to Ikeda.

A general meeting of the Hankaku Railway Company has decided to raise a loan of $1,500,000 from a Japanese capitalist for the extension of the shipping business, etc., of the company. The net profit for the period just closed amounted to $36,000, and after providing for the reserve, etc., a dividend at the rate of 3.2 per cent per annum was declared.

A general meeting of the Sanyo Railway Company adopted a proposal to present $10,000 to Mr. Matsumoto, late president of the company, in recognition of his services. A proposal to construct 140 open steel goods trucks with conductor's compartments, also to carry 9 tons, and 10 7-ton goods brake vans, at the estimated cost of $102,000, was also agreed to. The net profit for the period just closed has been declared at $1,244,800.

Petroleum

The subscription list of the Hoko Petroleum Company has closed after the shares were over-subscribed about three times. The business of the company is to purchase small oil wells in Echigo, now being worked by primitive methods, and with up-to-date equipments work these wells in a more business-like manner.

The result of the working of the Hoden Petroleum Company of Echigo or Niigata Prefecture, for the half-year just ended, has been as satisfactory as ever before. The net profit of the company amounted to $334,900, including a surplus brought over from the preceding period. Of this sum, $15,000 has been placed to the reserve; $225,000 is available for dividend at the rate of 30 per cent per annum; $12,500 is devoted to bonuses of officials and employees, and the balance is carried forward.

Large Expenditures in View

The fine showing of industrial growth will be far surpassed by the years 1905 and 1906. The war strengthened the credit of Japan, and foreign money is seeking loans and investments here in astonishing quantities. The banks have therefore reduced interest rates on fixed deposits from 5½ to 5 per cent. The following is a partial list of industrial loans recently made and being negotiated, totaling $115,000,000:

Electric railway companies: Moji, $350,000; Kioto-Osaka, $2,500,000; Osaka-Kobe, *$1,000,000; Myojin, $1,000,000; Tatsuno, $125,000; Dairen, $750,000.

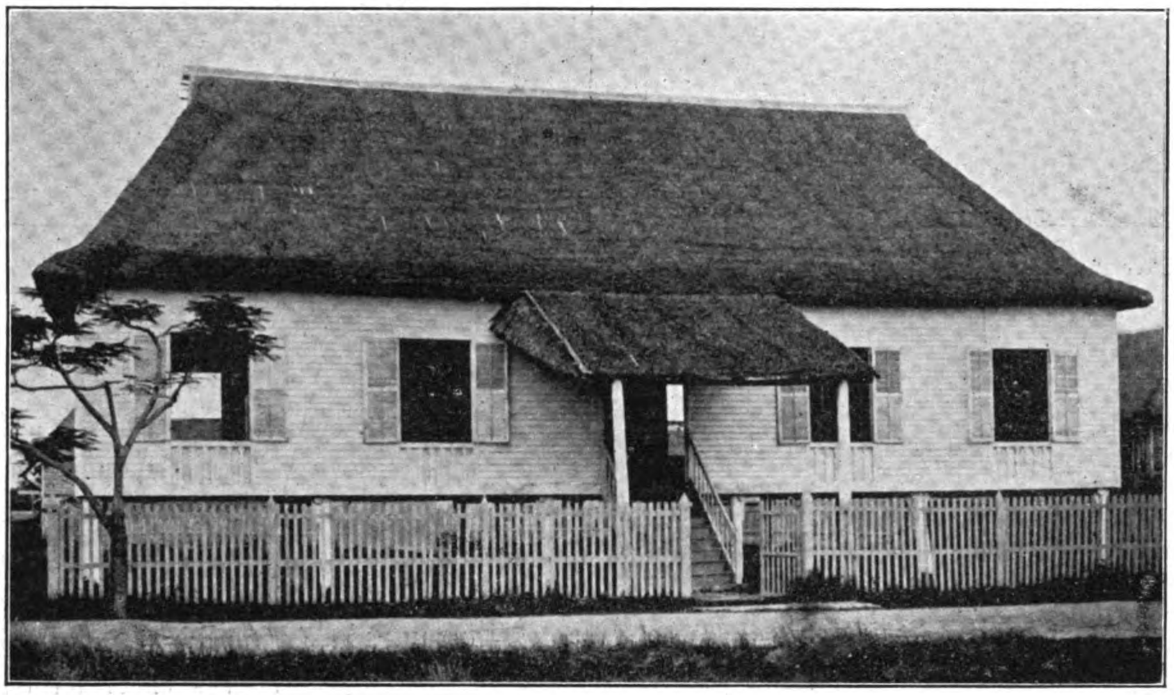
Electric light companies: Osaka, $1,400,000; Tokyo, *$2,500,000; Nagoyo, *$350,000.

Water power electric companies: Uji, $6,250,000; Hakone, $400,000; Fuji, $15,000,000; Tamagawa, $10,000,000; Tokyo, $1,500,000; Himeji, $75,000; Nankai, $75,000; Kisogawa, $1,500,000; Ogaki, $100,000; Iyo, $150,000.

(Continued on page 99)

PUBLIC WORKS IN MOROLAND

Extracts from the Annual Report of the Engineer of the Moro Province



MORO SCHOOL

DISTRICT OF LANAO.

Iligan-Lake Lanao Road:—This work was taken over from the military in June, 1904. Up to that time the road, which, as is well known, was an unsurfaced earth road. Practically all the bridges were of rough wood and the roadway itself covered with light corduroy through the more troublesome places. The ditches had become choked with undergrowth, and the road everywhere was in need of immediate labor.

Three hundred thousand pesos having been appropriated for this road, 1st Lieutenant H. C. Jewett, Corps of Engineers, was directed to make a survey, with plans and estimates, for its permanent improvement. Early in the second quarter, specifications for the formal improvement of the road, under a project sanctioned by the Council were prepared and advertisement for bids published in two Manila papers. No bids having been received, authority was granted by the Council for the prosecution of the work by day labor and the purchase of material in the open market. This necessitated the procurement of a ten-ton road roller, a traction engine and cars, and a large jaw crusher.

Schoolhouse at Marahui:—Acting under a resolution of the Council, plans for a school-house at this place, together with specifications and an estimate of cost, were duly prepared. No proposals were received in response to the published advertisement. Acting upon the revised recommendations of the Superintendent of Schools, actual construction has for the present, been postponed. Amount of appropriation in Act 85, of the Legislative Council, ₱2,000.00.

DISTRICT OF SULU.

Asturias Bridge:—This work had been begun late in the preceding fiscal year by day labor and the purchase of material in the open market, the original appropriation being that of Act 54, of the Legislative Council, subsequently increased in Acts 63 and 85 to a total of ₱5,300.00. The bridge itself is a concrete arched bridge of twenty-five foot span and twelve and one-half foot rise, with massive concrete abutments, wing-walls and rails. The masonry work was completed early in October and from that time to February 28th work was confined to grading and surfacing the approaches.

Tulay Bridge, Jolo:—This is a pile bridge with concrete abutments, whose construction by day labor was begun in November, after a failure to secure bids, the appropriation for the work being ₱4,300.00, made in Act 85 of the Legislative Council. Up to the close of February, all the bridge piles had been driven, capped and braced, and the floor placed over two bays. The piles for the concrete abutments had been driven and both abutments largely completed. Expenditures, including all needed materials, ₱3,570.98.

Wharf at Jolo:—The break in the stem caused by the storm of October 30th, 1904, was temporarily repaired at a cost of ₱137.50. Plans were prepared for rebuilding one hundred and twenty feet of the head with molave piles.

Repairs to Streets of Jolo:—An appropriation of ₱3,000.00 was made for this work by Act 85, of the Legislative Council. Up to the close of February, the District Secretary, though notified to do so, had not submitted a project for the work, and accordingly nothing had been done.

DISTRICT OF DAVAO.

School-House at Davao:—In February, 1904, Act 36 of the Legislative Council appropriated ₱3,000.00 for part payment of the cost of building a school-house at Davao, the remainder of the cost to be covered by local subscription. After the usual failure to secure reasonable bids, this office took up the execution of the work under the local charge of the District Secretary, who is, under the law, the representative of the Provincial Engineer upon work in his district. The work proceeded slowly and apparently unnecessarily expensive. During the time under report, the building was about eighty-five per cent completed, the quality of the work being, however, excellent. Total expenditures ₱4,172.00, together with ₱603.12, Mex., local contribution.

Beach Road at Davao:—Under appropriations aggregating ₱4,500.00 made in Acts 26 and 85 of the Legislative Council, this work was also begun by the above-mentioned District Secretary in July, 1904. In the beginning progress and quality were both exceedingly poor and this work and the preceding one suffered financially to a considerable extent, due to the peculiar management of the District Secretary, and it became necessary to transfer the charge of these works to an employee of this office sent to Davao for that purpose Thereafter progress was excellent and the work well-managed and executed. At the close of February, the work was about seventy per cent completed. Expenditures to the close of December, ₱2,498.67. No report of expenditures since that date.

Santa Cruz Telephone Line:—Up to the end of February the line was completed and in good working order to Tagulaya. Expenditures not reported.

Santa Cruz Road and Matina Bridge:—Up to the close of February, no projects covering these works had been submitted. A plan for the Matina bridge had been received but had been returned for revision.

DISTRICT OF COTABATO.

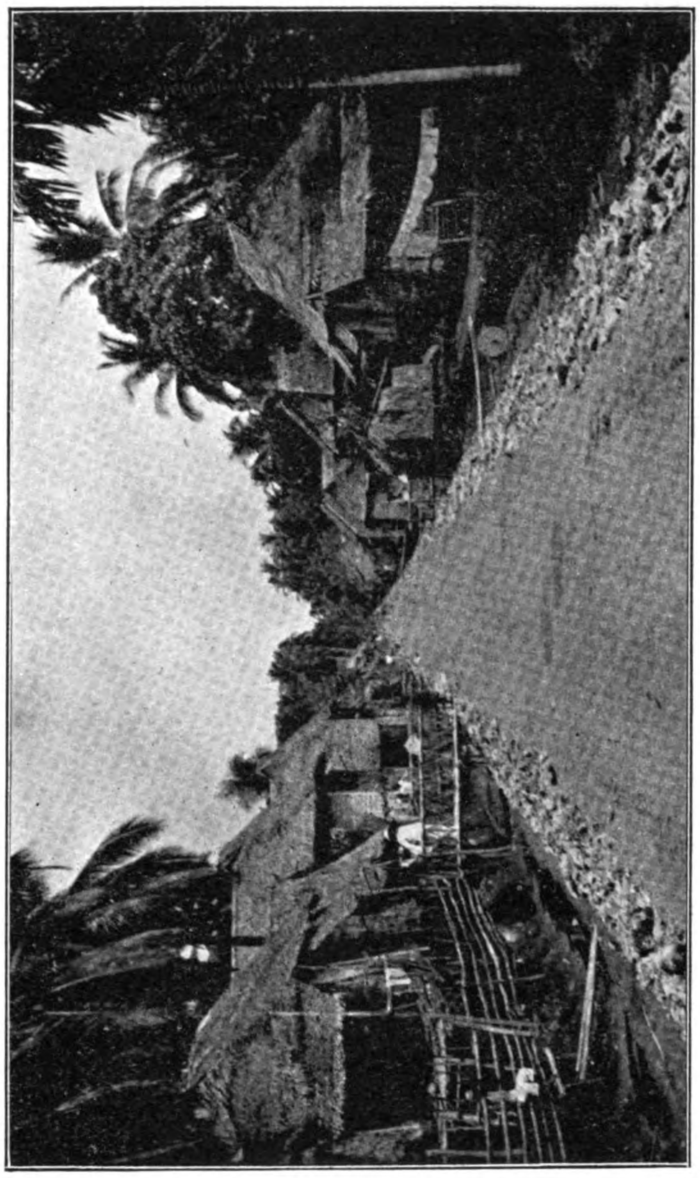
During the period covered by this report, no work has been done other than the reconstruction of the wrecked beacons at the mouth of the Rio Grande. Under an appropriation of ₱150.00 in Act 85, L. C., this work was quickly and efficiently done by the District Secretary, Mr. Dunleavy.

DISTRICT OF ZAMBOANGA.

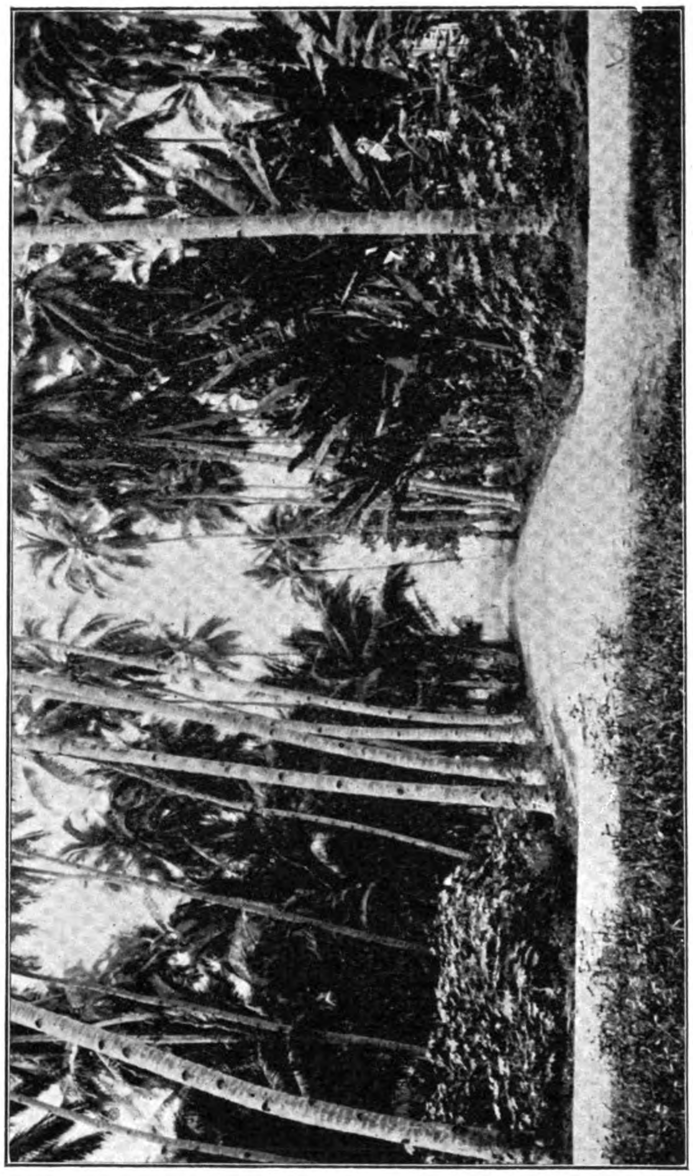
Moro Exchange:—This work was begun in the preceding fiscal year, under appropriations aggregating ₱3,400.00 in Acts 55 and 63. In addition, Pfs. 1,135.90, Mex., was contributed by individual Moros. The original plans called for the construction of a single large building with hardwood posts and nipa roof. This was built under contract with W. N. Clum for ₱2,269 00. Subsequently, a lodging house, cattle sheds, stalls, fish bins, fish sheds and wood yard—some of these with iron roofs—were also constructed by contract with Mr. Clum, part of the latter under an additional appropriation of ₱1,350.00, of Act 85, L. C. A well with curb and pump was installed in the yard, signs put up and various minor pieces of work were also performed, such as filling, grading and ditching. Total expenditures to close of February, ₱4,044.45 and Pfs. 1,135.90 Mex., the latter local contributions.

Provincial Jail:—This work was authorized by Act 36, L. C., and plans and specifications had been prepared during the preceding year. Upon advertisement, only one bid had been received, and this being excessive, the performance of the work by day labor became

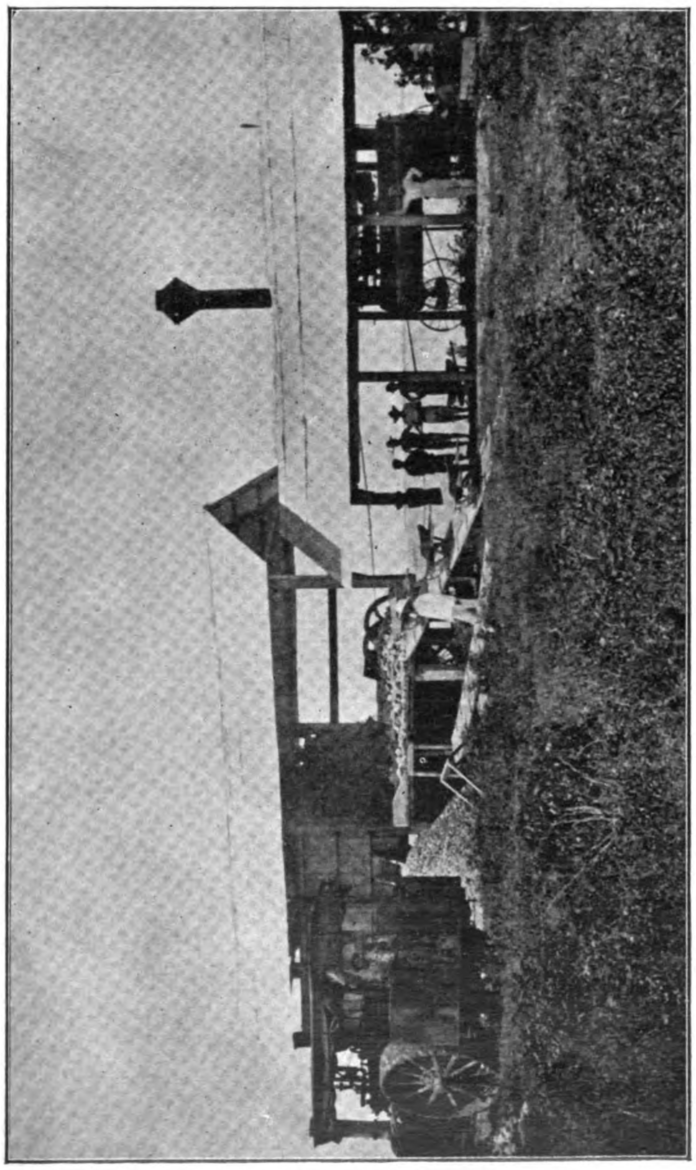
(Continued on page 96)



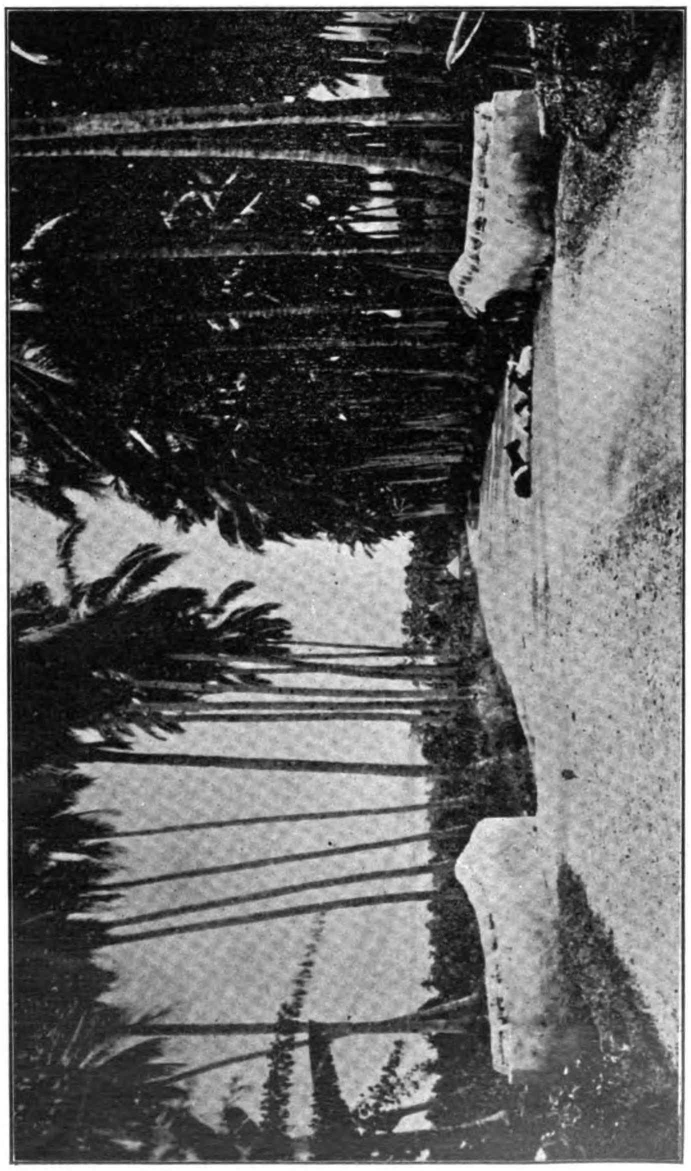
TETUAN ROAD



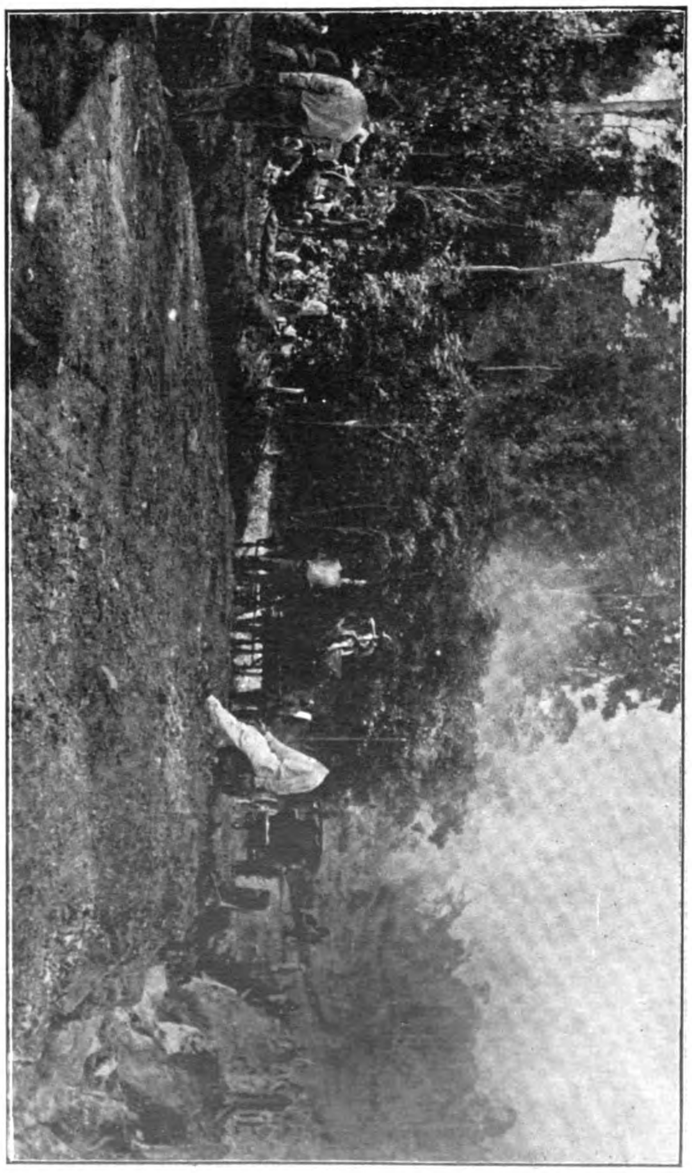
INTERSECTION OF TETUAN AND TALON TALON ROADS



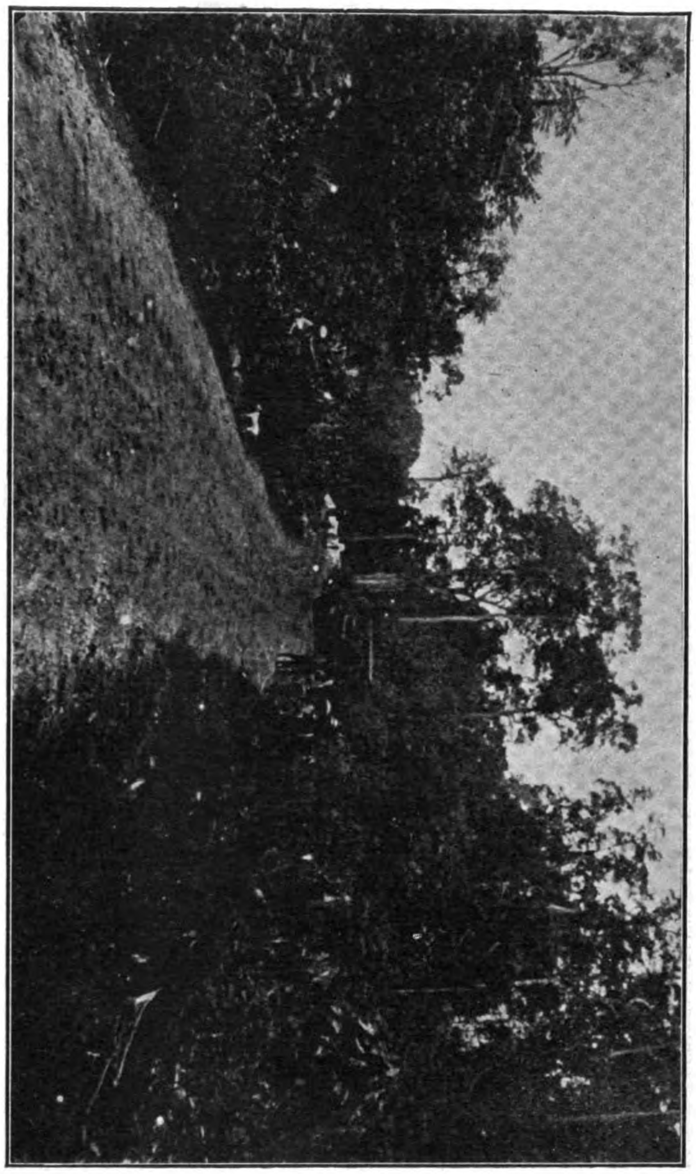
STONE CRUSHER, ZAMBOANGA



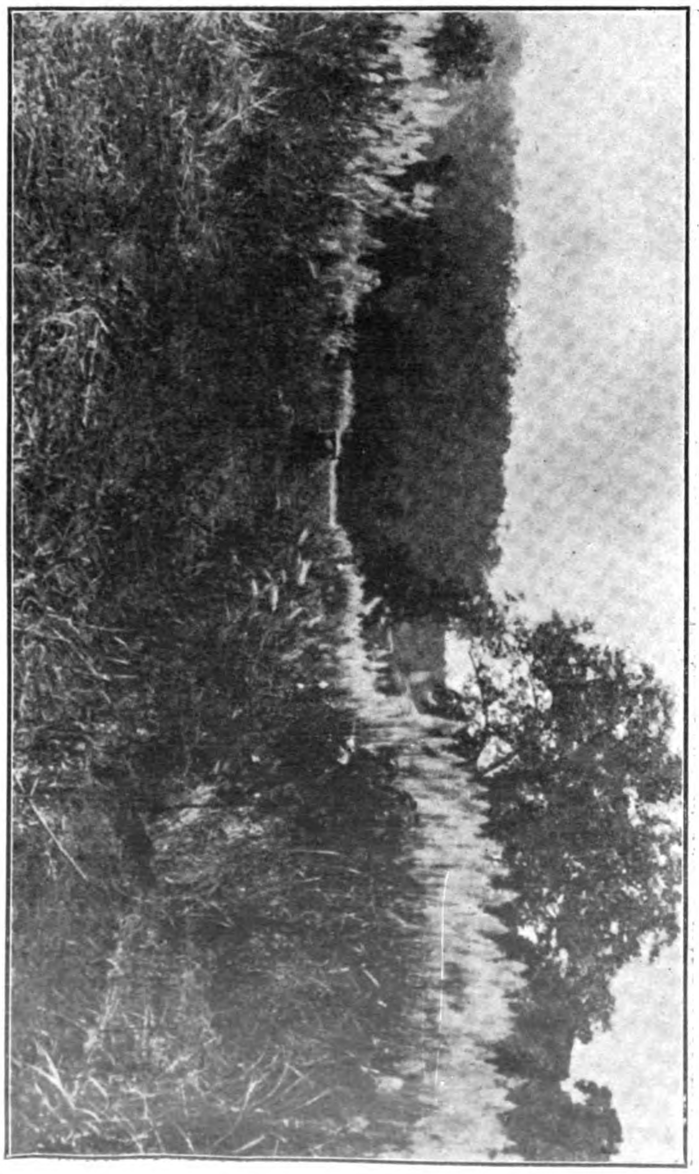
SAN JOSÉ ROAD



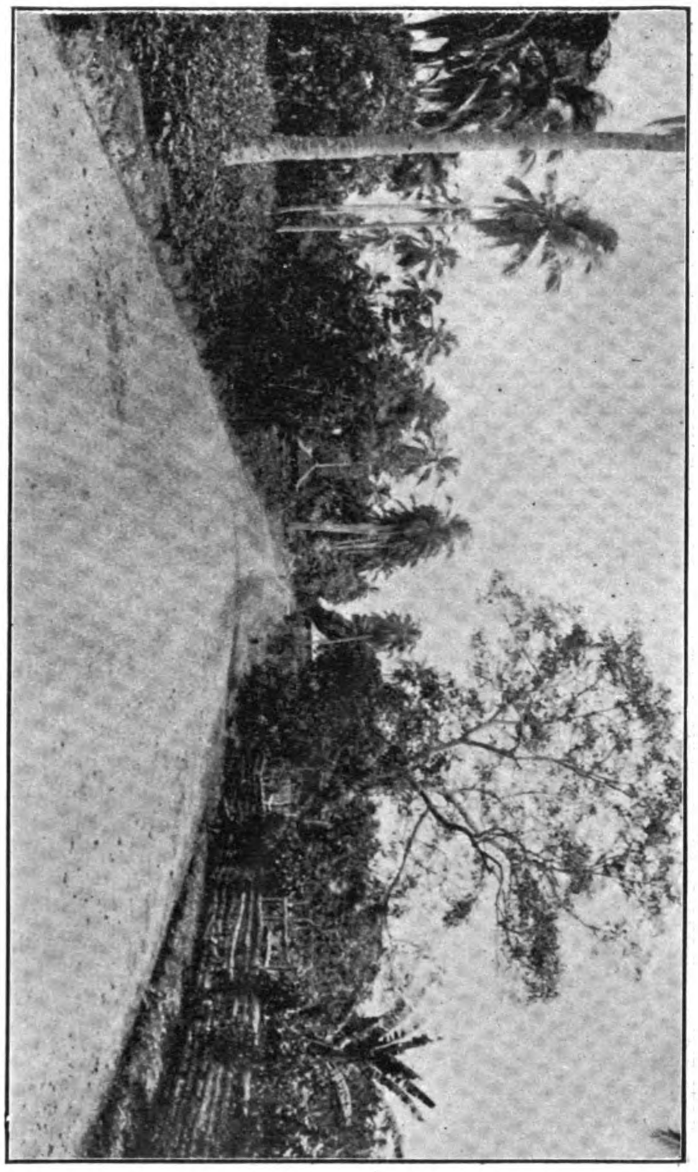
WORKING PARTY NEAR MURPHY RANCH



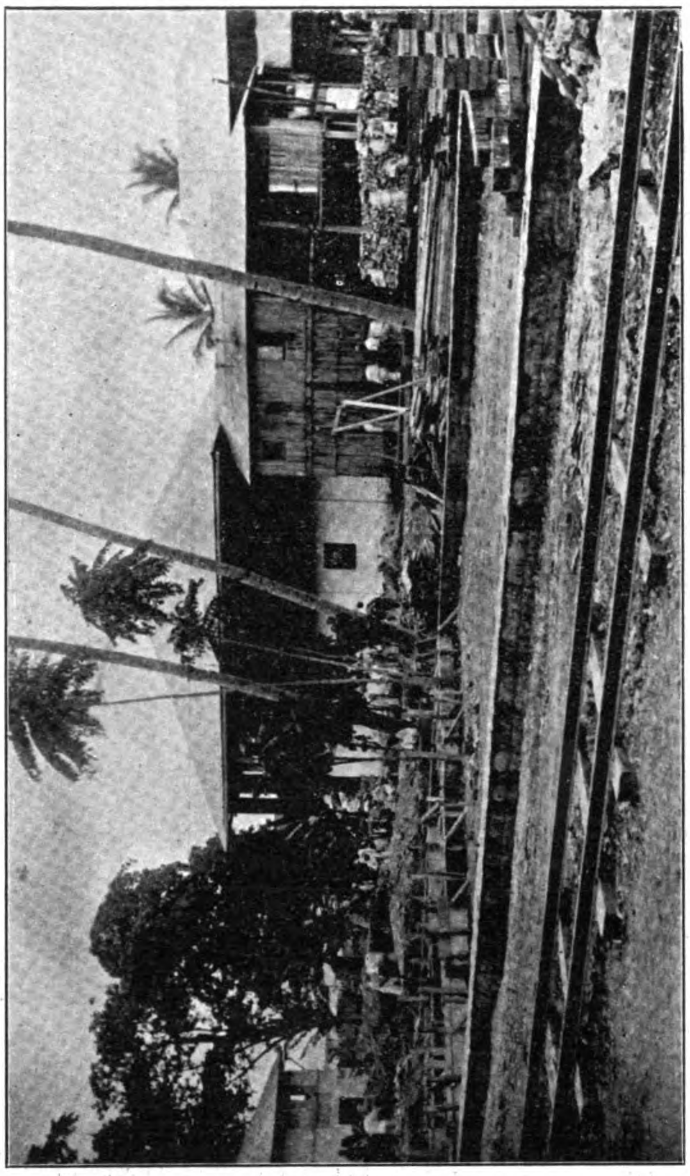
STEAM ROLLER AND COMPLETED PORTION NEAR MARIA CRISTINA, ILIGAN, LAKE LANAO ROAD



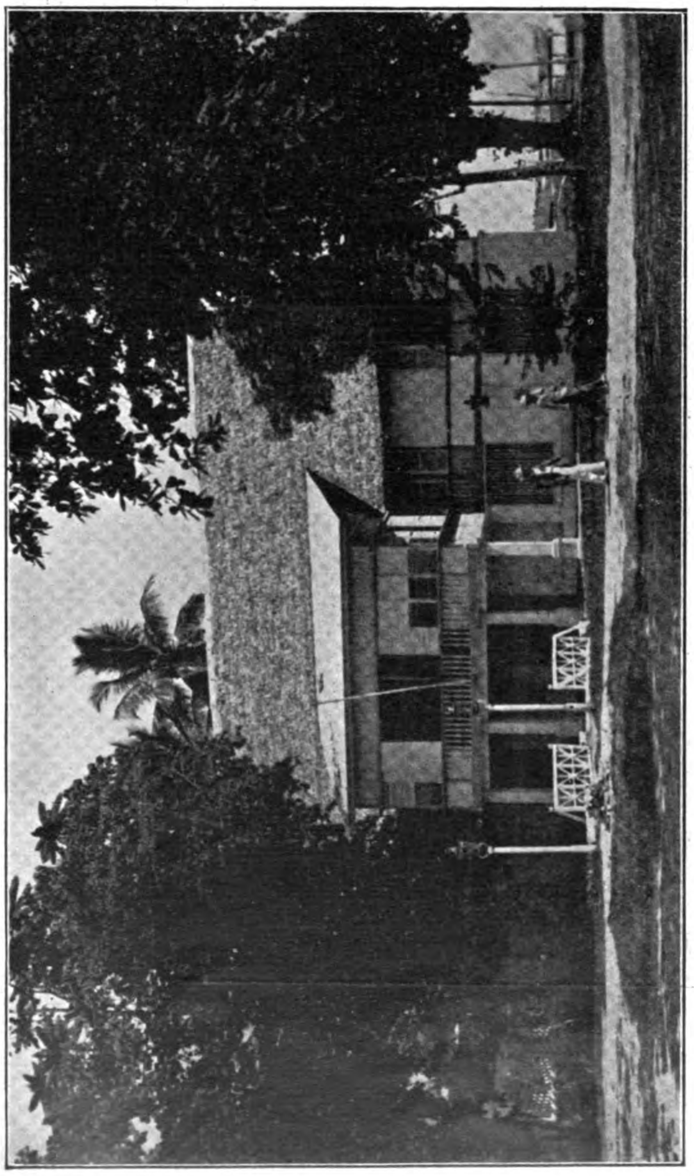
MIDWAY OF MOMUNGAN FLATS, ILIGAN, LAKE LANAO ROAD



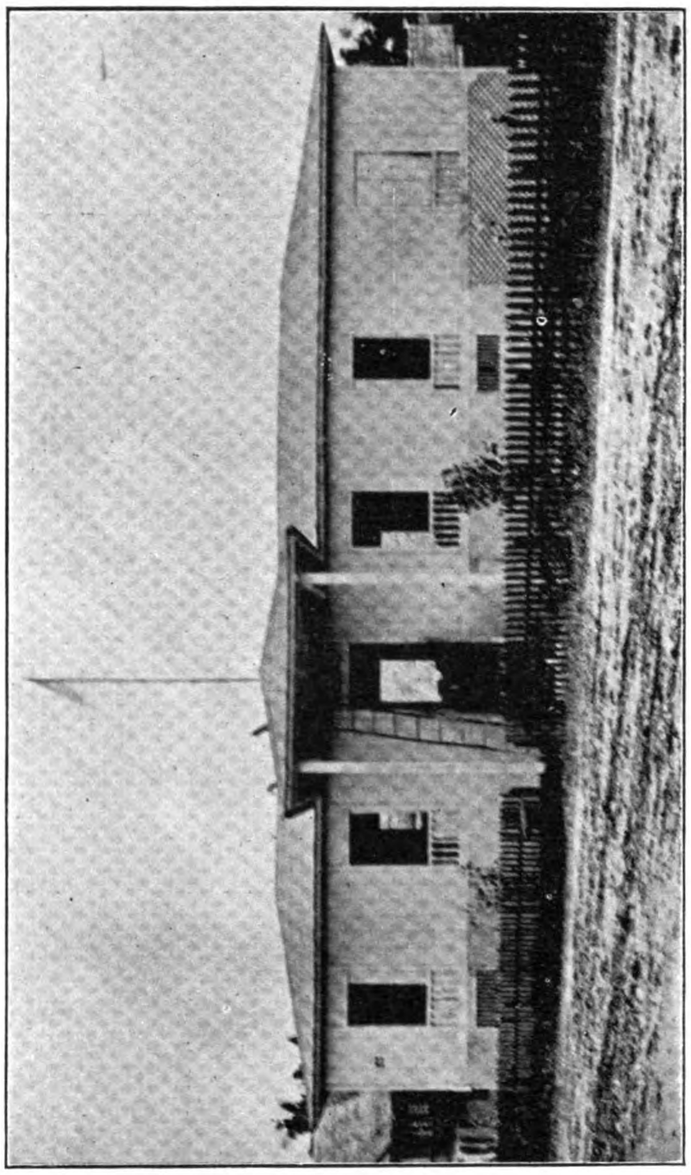
SAN JOSÉ ROAD



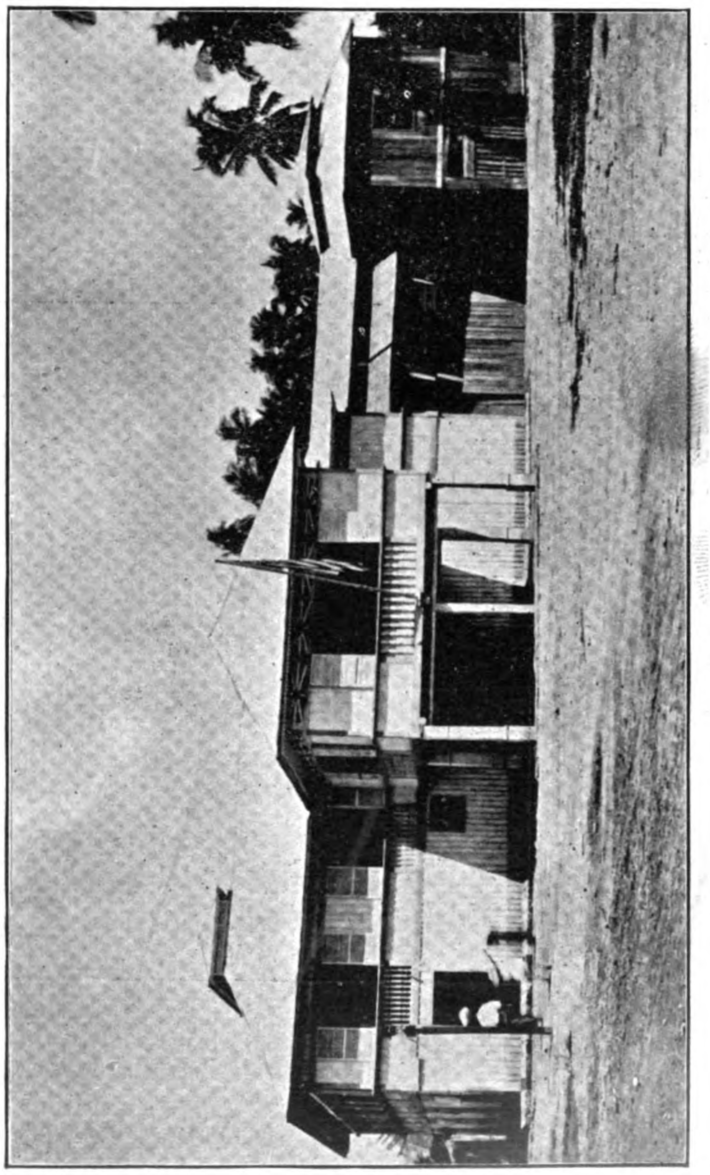
FOUNDATION WORK OF NEW PROVINCIAL BUILDING



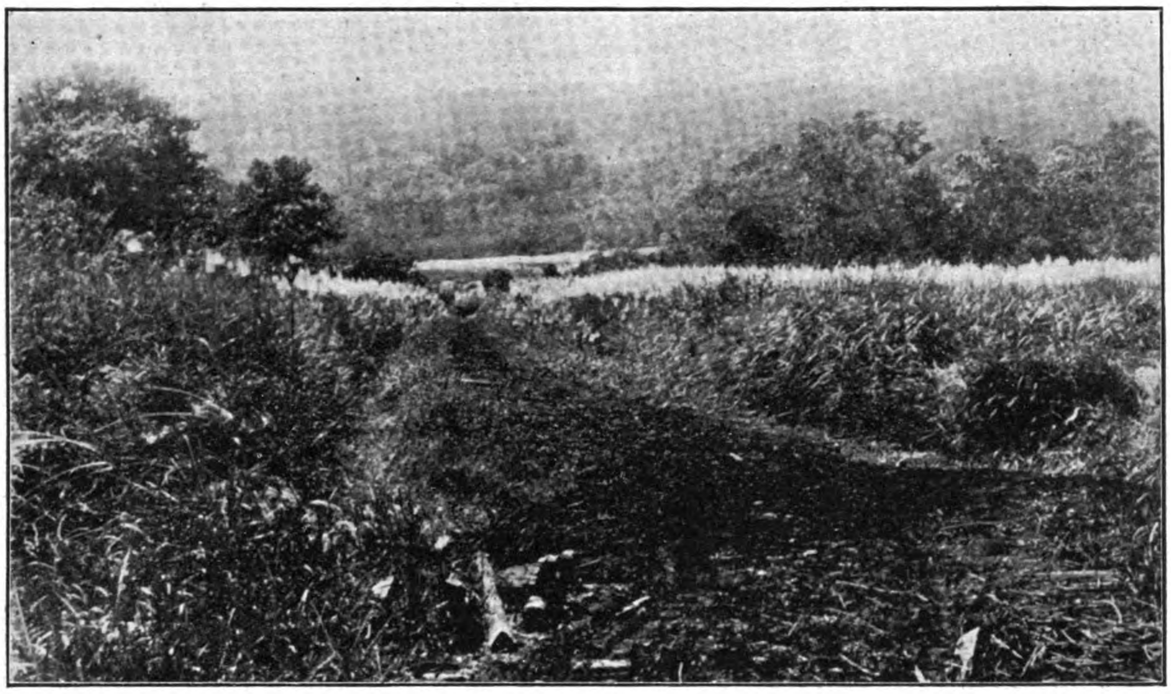
THE OLD PROVINCIAL BUILDING, SHOWING CANAL BRIDGE



BOYS' SCHOOL, ZAMBOANGA



GIRLS' SCHOOL, ZAMBOANGA



SOUTH END OF MOMUNGAN FLATS

PUBLIC WORKS IN MORO LAND

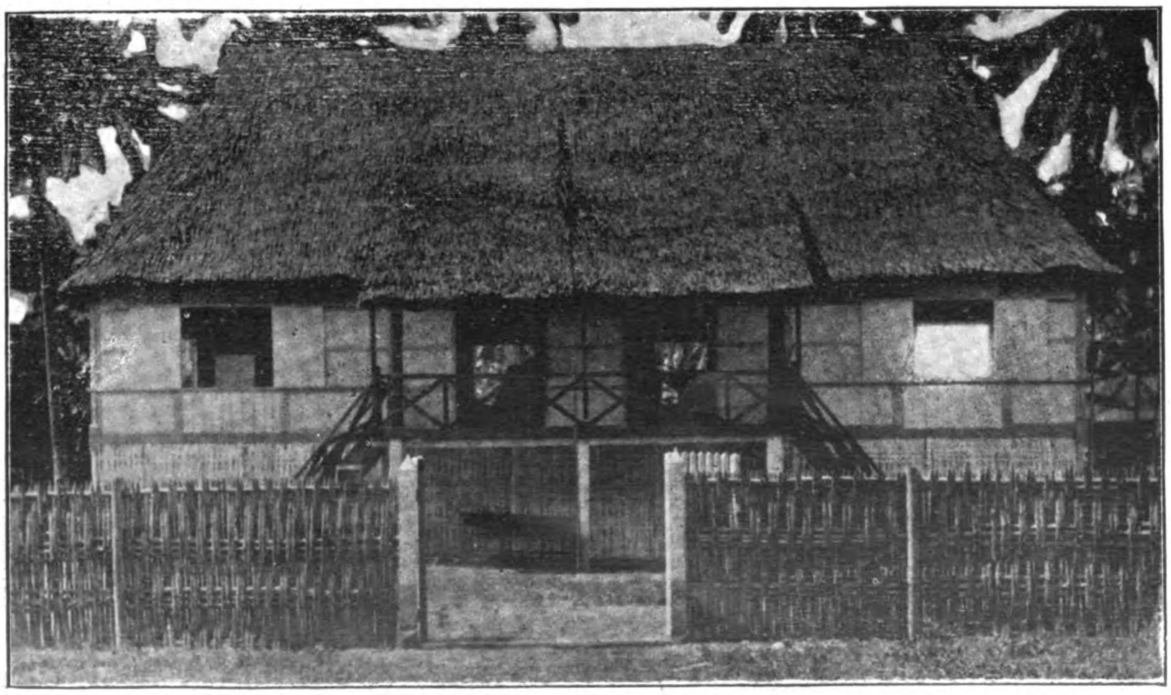
(Continued from page 92.)

necessary. Previous to October 1st, supplies were purchased, the site cleared, a well dug and storehouses, wharf and roads constructed. In addition, trenches for wall footings, and drains were practically completed, and a windmill pump with pipe connections installed. Actual construction began about October 1st, and at the close of February all outer walls had been completed, foundation for inner walls built, all inner drains and connections laid, and all roof timbers dressed, framed and put in place. The work was done by native labor under white supervision, and is most encouraging support of the belief that, under competent supervision, the native may be trusted to do good work. On this piece of work the same gang was employed throughout, and, all in all, did almost as much work as could have been done by white labor of the same grade. In the beginning, these natives were raw and ignorant, but they soon began to understand what was needed and to do it well. To the foreman, Mr. J. J. Gallagher, much credit for this result is due. Total appropriations for this work, ₱27,500.00, of which about ₱22,000.00 had been expended to the close of February.

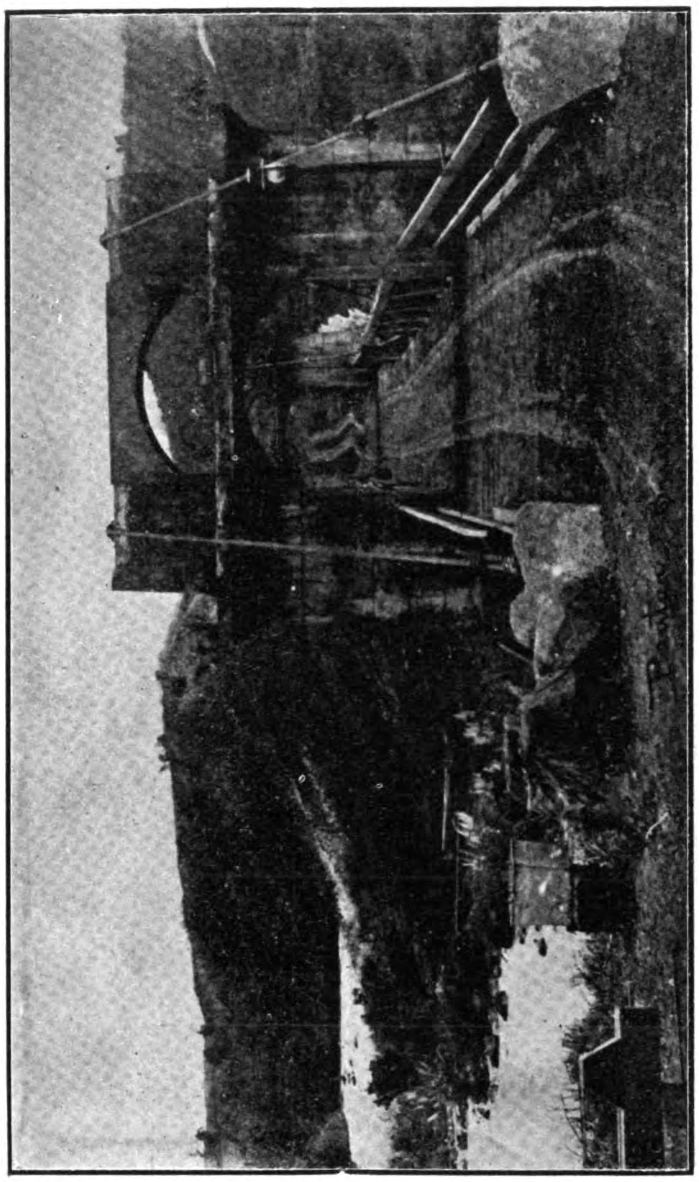
Acting under the belief that it would be preferable to locate a jail at a point where it would be isolated and where also it could not affect unfavorably the future growth of the town of Zamboanga, a site at the south-eastern corner of the "Mesa," about two and three-fourths miles from Zamboanga was selected. This site overlooks the harbor, has a fair water approach, ample public land around it for necessary future expansion, and, upon its beach, has a practically unlimited supply of small boulders which furnish a cheap and readily accessible supply of stone for a stone crushing plant.

Wharf at Zamboanga:—Under appropriations aggregating ₱18,500·00 made in Acts 19, 46, 60 and 103, L. C., this work in progress at the beginning of the fiscal year has been entirely completed, the head and three hundred and fifty feet of the stem outward from the Q. M. steps having been entirely rebuilt with piles and braces of molave batu, caps of yacal, ipil, pagatpat, guijo and balao, and decking mainly of balao and guijo. The entire cost of the work was about ₱17,000.00, which sum includes ₱700.00, the value of the material washed from the deck of the wharf and lost during the storm of October 30th, 1904, and also ₱800.00, the value of material on hand at Zamboanga and at Davao awaiting transportation. The work has been done mainly by a detachment of from four to five men from Company K, 3rd Battalion of Engineers, under command of Sergeant Powers, to whom much credit is due. The cost of the work has been increased by the difficulty of procuring piles, leading to expensive delays.

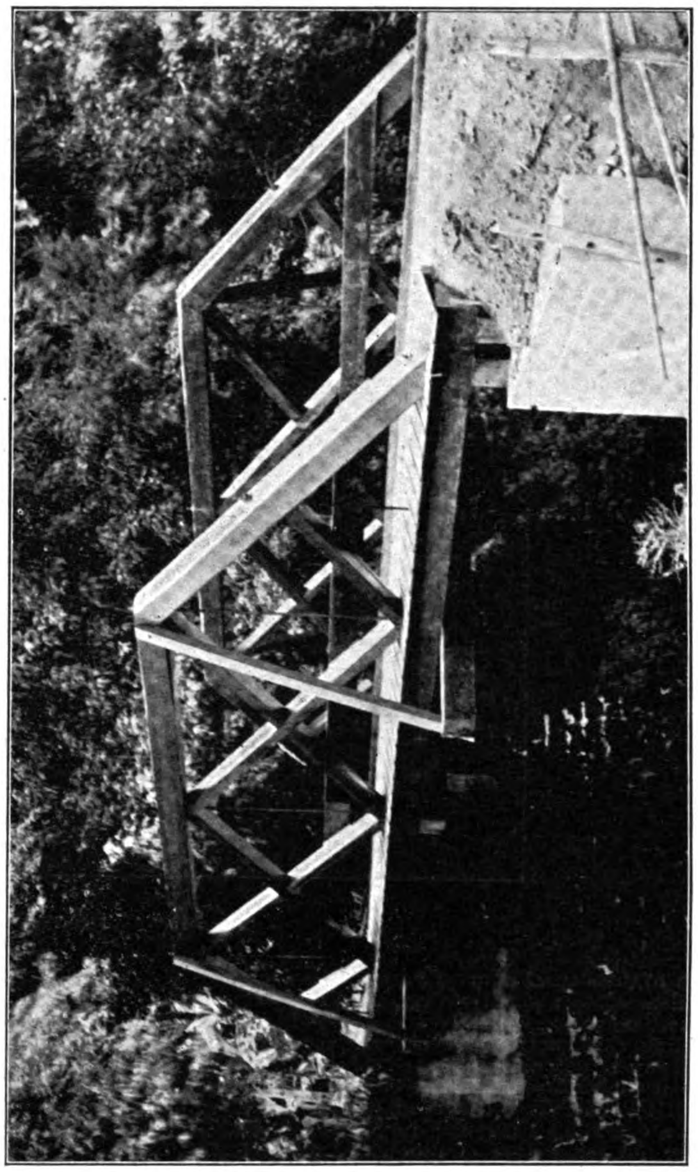
The wharf, as it now stands, is probably the best timber wharf in this part of the world, and the substructure should, judging by the pile portion of the Spanish wharf immediately



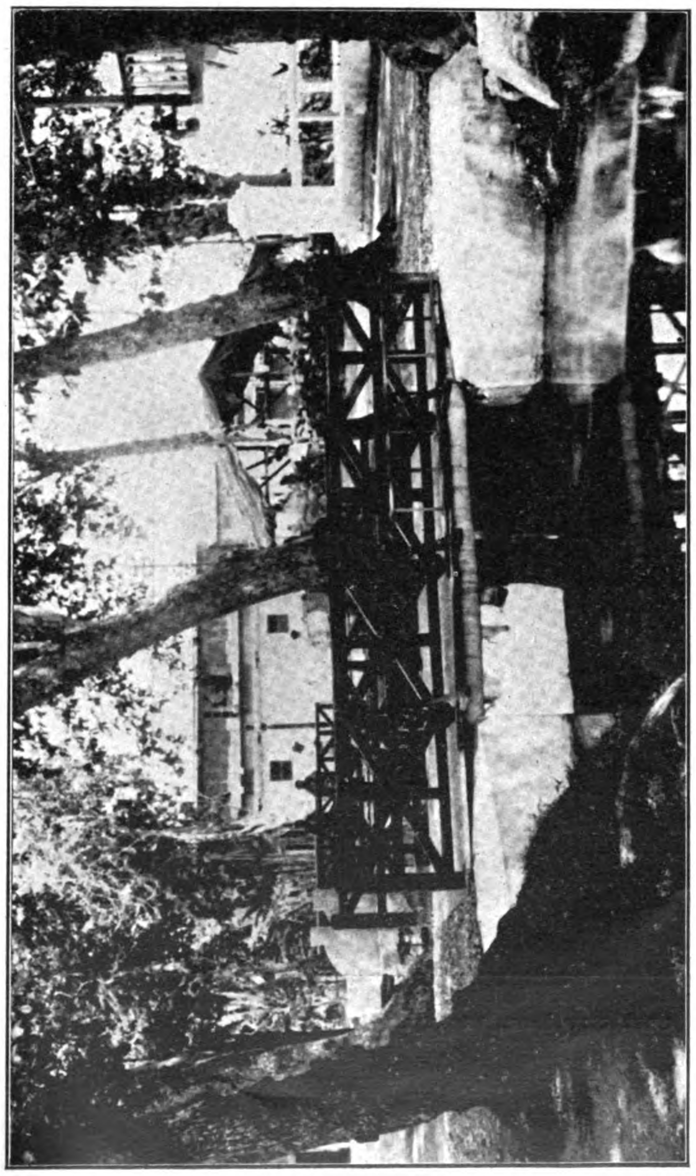
MANICOHAN SCHOOL HOUSE



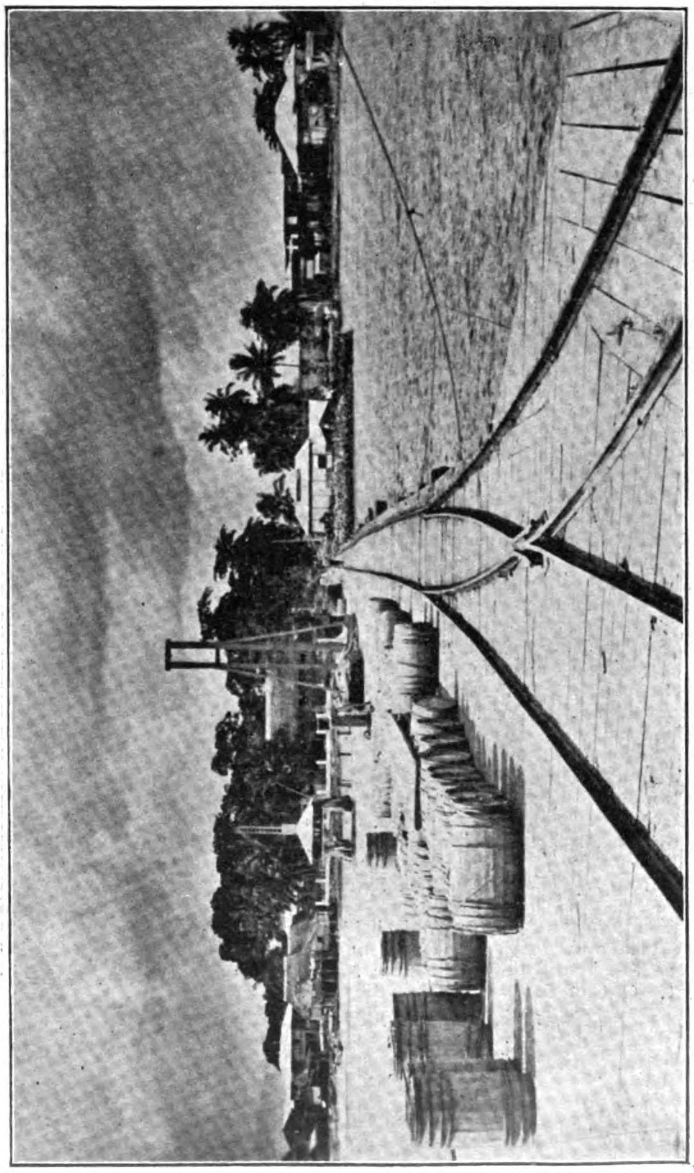
PANTAR BRIDGE



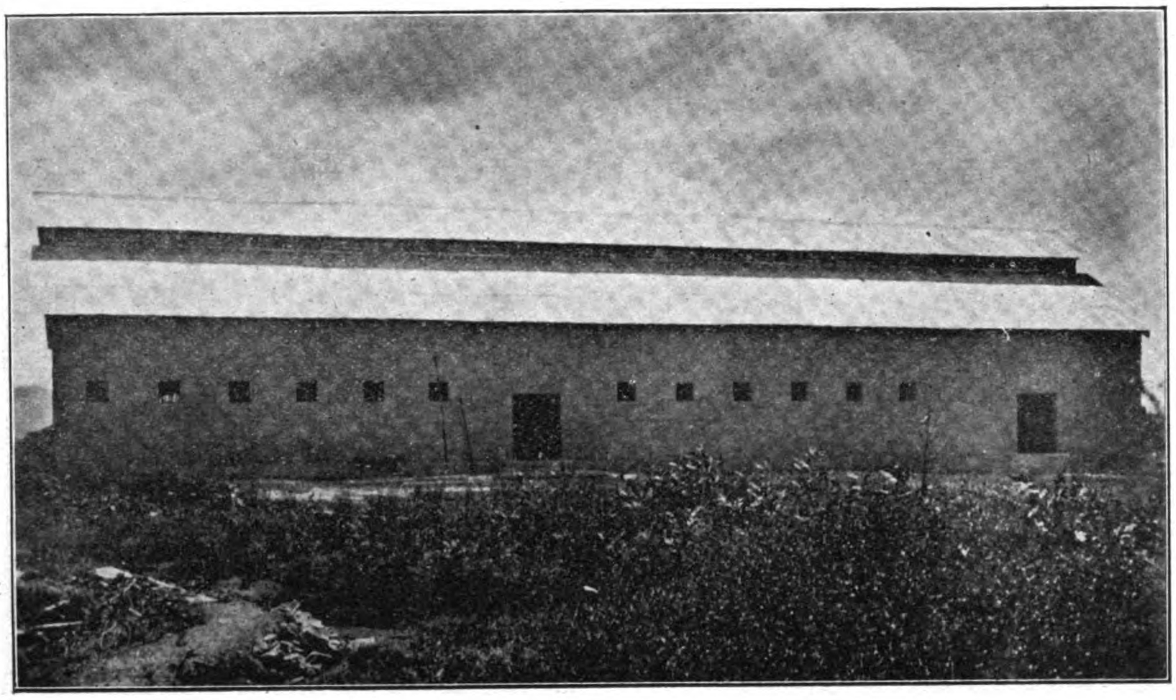
TUMAGA BRIDGE



A CANAL BRIDGE



ZAMBOANGA PIER, LOOKING FROM THE SEA



FRONT VIEW, PROVINCIAL JAIL

north of the steps, last many years. The deck and floor system will, however, need renewal at least once every four years. There is no avoiding this except by using a concrete or metal superstructure. Plans and specifications have been prepared and advertisement published for extending the head of this wharf by an extension triangular in plan so as to make the outer face of the wharf parallel to the direction of the current.

ROADS AND BRIDGES.

San Ignacio Bridge:—This bridge is on the road which, crossing the rice fields, connects the Santa Maria and Tumaga roads. It was rebuilt with piles of molave and superstructure of guijo at a total cost of ₱627.79, of which ₱346 was for labor. The bridge and its approaches are now in excellent condition.

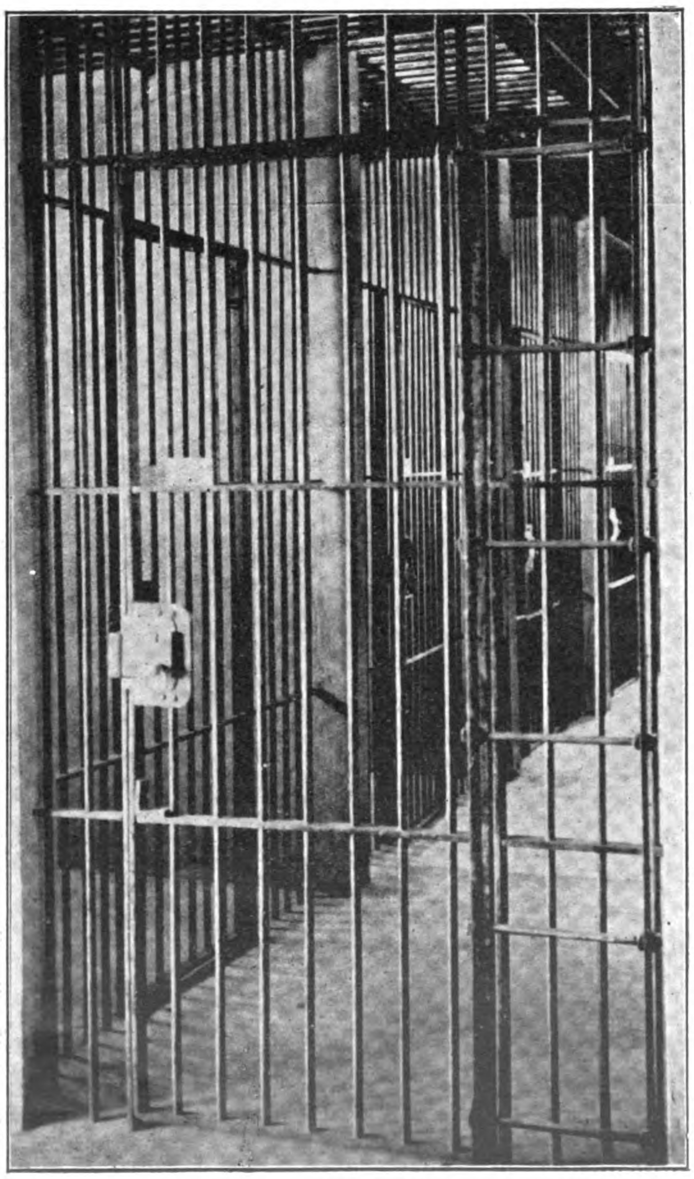
Bridge on Ayala Road Across Masin River: —This bridge was constructed from funds appropriated by Acts 36 and 63. It serves to render possible local traffic along the shore road, hitherto interrupted at high tides. The bridge is a simple structure with piles of molave aud braces and superstructure of pagatpat. Total cost ₱648.91. Both this and the preceding works, small in themselves, have been taxed with the cost of a month's hire of an American foreman, ₱200 per month.

Cauit Bridge: — The Cauit bridge was thoroughly rebuilt, and three open culverts, one east of Cauit bridge and the other two west of the Masin bridge, have been replaced. In addition, the swampy piece of land west of the Masin bridge has been repaired by the construction of dry retaining walls, holding a filling of sand and gravel. The materials used in the above work have been principally old and surplus materials from other works. The result has been to give the people living along shore in various little barrios means of intercommunication. Trade has thereby been considerably facilitated.

San Roque Bridge:—From an allotment made from the appropriation of Act 63, and using in part old material from the San Ignacio bridge, the bridge on the San Roque road, just south of the Santa Maria church, as well as two culverts on the same road, were rebuilt. Total cost ₱150. This improves the situation locally, but to render full service the entire road from San Jose to Santa Maria must be opened.

Santa Maria Bridge:—This bridge crosses the stream feeding the canal at the point where the San Jose and Santa Maria roads meet. Out of funds provided by Act 63, L.

(Continued on page 106)

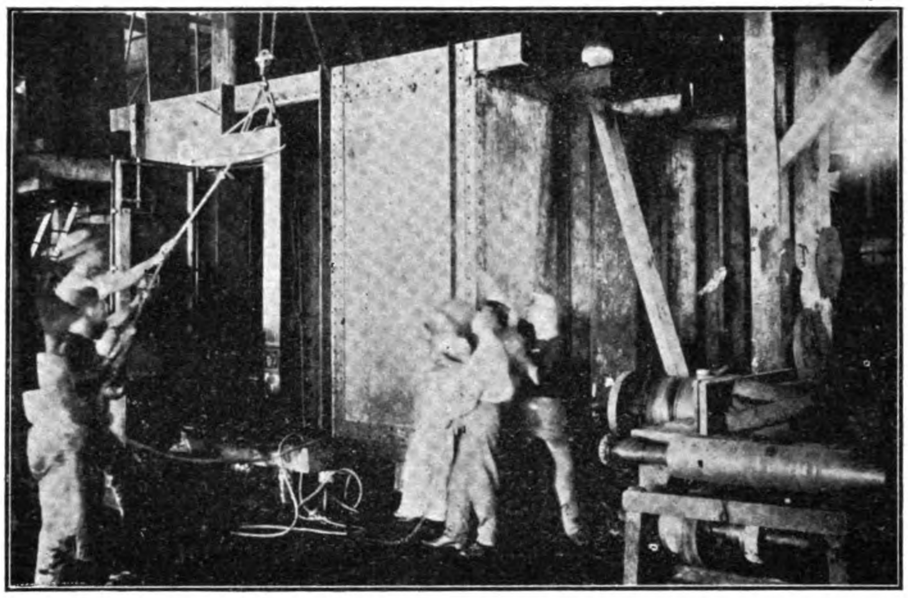


CELL CORRIDOR, PROVINCIAL JAIL

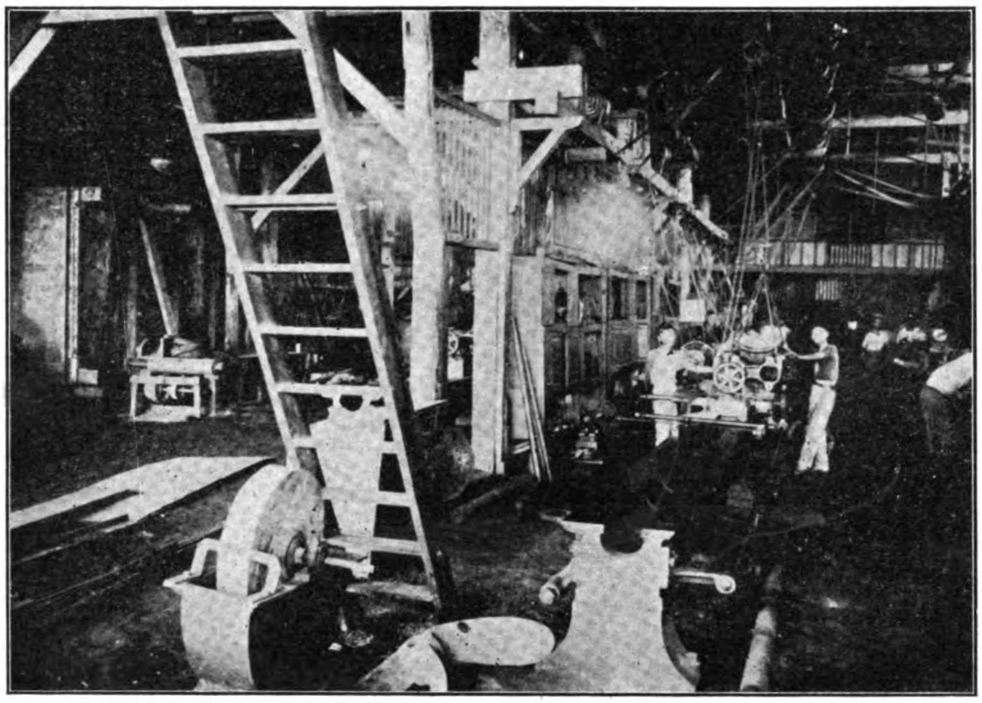
SAN NICOLAS IRON WORKS, LTD.

Last month we had occasion to comment editorially on the depression in the engineering and shipbuilding industry of the Islands, due to conditions favoring foreign concerns. Since then we have been assured, from high official sources, that steps are being taken to remedy the unsatisfactory state of affairs, and a law enacted which will enable the local engineering firms to secure on a favorable basis that trade which legitimately belongs to them. The Secretary of Commerce and Police, Hon. Cameron Forbes, has been giving considerable attention to this, as well as other measures tending to benefit local commerce and industry. Adequate legislation will be enacted from time to time, as complete investigations are terminated, and suitable measures of relief are drafted and planned out.

The shipbuilding and engineering industry is ably represented in Manila by the San Nicolas Iron Works, Ltd. This company was organized, in 1900, with a capital of $300,000 divided into 600 shares of $500 each, which are all paid up. The company has been successful from the start, under the able direction of Smith, Bell & Co. The unsatisfactory conditions prevailing in the Islands have prohibited any large dividends, but with equitable treat-



SAN NICOLAS IRON WORKS: STEEL SAFE DEPOSIT VAULT MADE FOR MORO PROVINCE



MACHINE SHOP OF THE SAN NICOLAS IRON WORKS

ment and protective legislation now on the way, its shares may be expected to experience a decided rise in value, as more work is kept at home.

The works in San Nicolas are fully equipped with good modern labor-saving tools for the ordinary repair work, in addition to which they construct launches, lorchas, cascoes. Many of the lighters in use in Manila Bay were constructed by the Iron Works, and several have been built for the use of the Navy Department. Much of the Government work has been done at the shops of this company, the last important order being a large steel safe deposit vault for the Treasurer of the Moro Province.

JAPAN'S DEVELOPMENT

(Continued from page 91.)

Cotton-spinning companies: Wakayama (new), $225,000; Wakayama, $150,000; Murai, $15,000,000; Nippon, $500,000; Godo, $400,000.

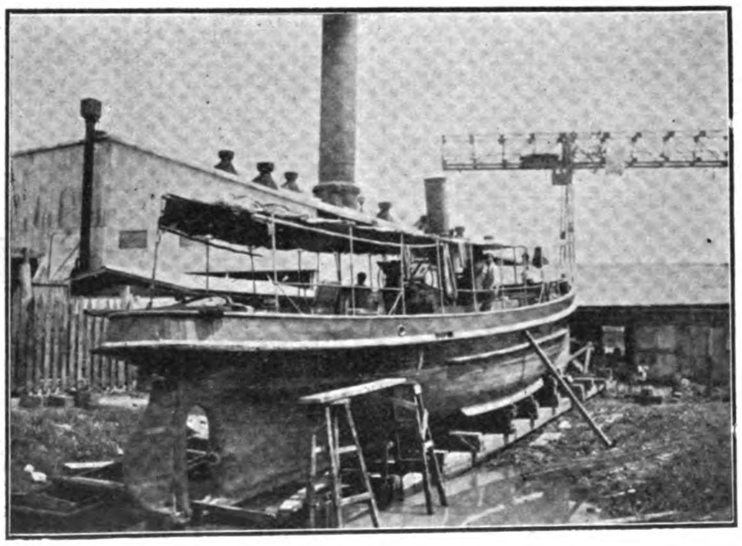
Local bonds: Yokohama City, $1,350,000; Niigata, *$500,000; Yokkaichi Harbor, $750,000; Tokyo Water Works, *$5,000,000; Nagoya City, *$5,000,000.

Coal mining, etc.: Ibaraki coal, $250,000; Kerosene iron pipe, $500,000; Ishikari coal, $7,500,000; Takashima gold, *$100,000; Kumoi coal, *$3,750,000; Namboku kerosene, $750,000; Hokkaido colliery, *$5,000,000.

Various companies: Tokyo Trust, $500,000; Warehousing, $1,500,000; Tokyo Stock Exchange, $1,375,000; Tokyo Sakura Gumi, $250,000; Osaka Sulphuric Soda, $1,200,000; Tokyo Rope Factory, $125,000; Osaka Shosen Kaisha, $2,500,000; Tokyo Paper Mill, $250,000; Osaka Stock Exchange, $700,000; Fusan Dock, $1,000,000; New Fire Insurance, $2,500,000; Dai Nippon Aquatic Product, $1,500,000; Toyo Sea Product, $250,000; Imperial Hotel, $67,500; Kawasaki Shipbuilding, *$8,000,000.

Railway companies: Iwa (Ise-Izumi), $250,000; Kwansei, *$6,000,000.

Loans marked by (*) are to be raised abroad; of these the loans of the Tokyo Electric Light Company, the Nagoya Electric Light Company, and the Kwansei Railway Company have been settled. Of the $5,000,000 proposed by Nagoya City one half only will be raised abroad. It is reported that some of the foregoing companies intend to utilize their reserve funds and increase their capital.



SLIPWAY OF THE SAN NICOLAS IRON WORKS

MESSRS. KELLER AND GOHN IN A FIELD OF 12-MONTHS-OLD HEMP AT SANTA CRUZ, DAVAO. DIGGING CAMOTES IN HEMP FIELD OF MINDANAO ESTATES CO., HEMP "FOREST" ON PLANTATION OF SR. SANCHEZ

HEMP IN MINDANAO

For more than half a century the production of *abaca*, or Manila hemp, has been the most important industry of the Philippine Islands. The annual exports of this fiber are now more than 2,000,000 piculs, and represent approximately 66 per cent in value of the total exports from the Islands. Each year shows an increase both in the area under cultivation, and in the amount of fiber produced. New plantations are being developed, and on many of the older plantations more thorough methods of cultivation, and improvement in the work of extraction, are resulting in a product superior to that of former years.

Hemp is grown more or less extensively on all the larger islands of the Philippine Archipelago. Its successful cultivation requires certain well-defined conditions of climate and soil. These conditions are, with respect to climate, a heavy and fairly evenly-distributed rainfall, a high degree of atmospheric humidity, and immunity from severe windstorms. The soil should be deep, rich loam, moised but at the same time well drained; containing a large amount of humus, organic matter; and of volcanic origin. A very favorable combination of these conditions is to be found in certain parts of S. Mindanao.

This territory, including the Sulu Archipelago, is divided into five districts—Zamboanga, Jolo, Lanao, Cotabato, and Davao. In these several districts we find several marked differences in climatic conditions. As climate has such important bearing on the cultivation of abacá, the future development of this industry in the several parts of the Moro Province will be largely determined by these conditions. At the present time the greater part, and the best quality of abacá produced in S. Mindanao comes from the District of Davao.

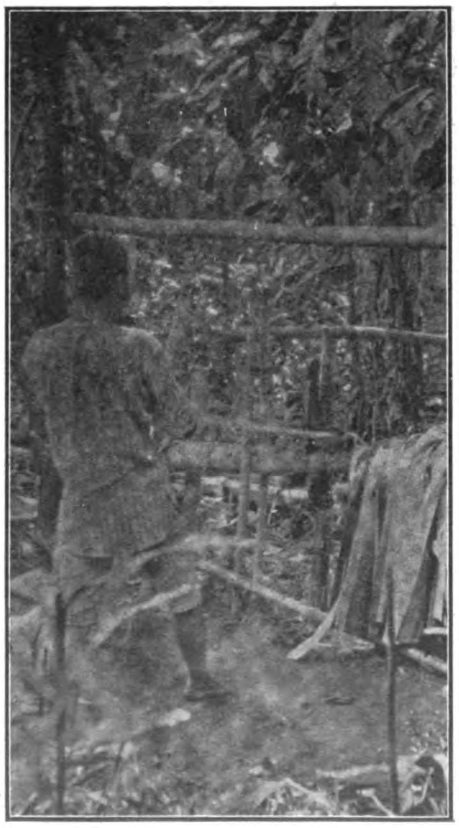
District of Zamboanga.—Comparatively little abacá is produced in the District of Zamboanga. Quite extensive plantings have been made at the San Ramon Government Farm, on other plantations in that vicinity, and on the Island of Basilan, all of which have suffered severely from drought on several occasions during the past few years. The climate of Zamboanga, as far as humidity is concerned, is favorable for abacá, but the rainfall is often insufficient, and except in locations where irrigation is possible hemp cultivation in this district is a rather uncertain proposition.

District of Jolo.—In the District of Jolo abacá is grown exclusively on the Island of Jolo. The approximate area now devoted to the fiber is estimated at 1,500 hectares, much scattered. About 1,200 hectares of land on Jolo Island may be considered suitable for abacá culture, and it could probably be grown on the smaller islands of Pata, Siasa, Lugus, and Tapul. As the Moros have no title to land the sale and purchase of same is difficult.

Climatic conditions are similar to those of Zamboanga. Labor is difficult to secure and is mostly employed on the share system. Carabaos are scarce.

Five varieties of abacá are grown, as follows: —Lanud batang, 1st class; Lanud lahang, 2d class; Lanud patih, 3d class; Lanud banbanum, 4th class; Lanud gutai, inferior.

There are no large plantations . Hemp is planted without shade and rice is grown on the same land the first year. The fiber is not classified but is all sold in Jolo as one quality. The local price is from ₱18 to ₱20 per picul. About 10,000 piculs of fiber and handmade rope are exported annually to Singapore and Manila. When the price of abacá is low the Moros manufacture it into rope for export. The fiber is used locally for making rope, cloth, fishing nets and lines, stirrup straps, bridles, and girths.



JAPANESE LABORERS STRIPPING HEMP

Hemp planting by the Moros is steadily increasing and the future of the industry in this district is promising.

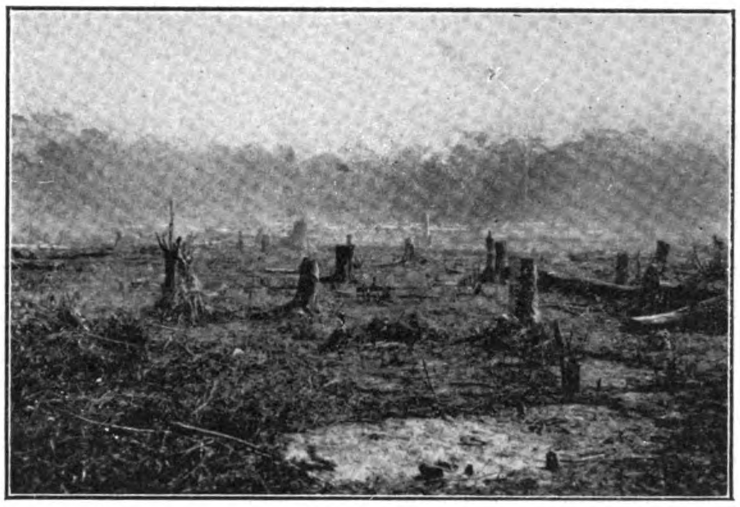
District of Lanao.—In Lanao there are but few towns, the population being much scattered. Abacá is to be found growing in small plots in all parts of the district, being more largely produced in the vicinity of Tuburan in the SE. part, and near Iligan in the NE. A large part of the land in the district outside of Iligan is Moro land and not for sale.

The climate resembles that of Zamboanga. Owing to unsettled conditions satisfactory labor is difficult to obtain. Carabaos, also, are scarce. Abacá suckers for planting are secured from Davao, and cost about ₱50 per thousand. The dapdap tree, which is used as a shade for abacá in S. Luzón, is also utilized for this purpose in Lanao. Cacao is cultivated to some extent on the same land. The Lanao fiber is almost entirely third grade with a small quantity of first and second grades. No fiber is exported, that which is produced being used locally for the manufacture of native cloths and cordage. When this country becomes a little more settled the planting of abacá should assume a position of some importance.

District of Cotabato.—But little abacá is produced in Cotabato at the present time, but there are large areas in this district suitable for this purpose. In the upper part of the Cotabato Valley there are said to be thousands of acres of good hemp land. Climatic conditions are somewhat similar to those of Zamboanga, but with a heavier rainfall are more favorable. Labor is scarce and difficult to secure.

In this district abacá is grown both with and without shade. Camotes and peanuts are cultivated on the same land. Suckers for planting are scarce and expensive. The total annual output of fiber is very small. It has been stated by the district governor of Cotabato that with capital and reliable labor the Cotabato Valley would produce more abacá than any other center in the Philippine Islands.

District of Davao.—Davao occupies the SE. portion of Mindanao and is, by ordinary routes of travel, approximately 1,000 ms. from Manila. The district is 145 ms. long from N. to S., and 127 ms. wide from E. to W. The area is 9,171 sq. ms., or 856 sq. ms. larger than the State of Massachussetts. With respect to physical features, a long range of mountains extends from the extreme N. boundary to the S. coastline. From the range numerous rivers flow into the Celebes Sea, Davao Gulf, and the Pacific Ocean. In these river valleys and along the coast plain are large areas of land of great fertility. The population is between 30,000 and 40,000, and consists of Visayans, Moros, and a number of different native tribes. The people belonging to these tribes



BURNING HEMP LANDS

are entirely friendly to the American settlers, and form the principal source of labor on the plantations.

The capital and largest town of the district is the Pueblo of Davao, situated near the head of Davao Gulf. There are few roads, but the trails are generally in good condition and the rivers and sea furnish a means of cheap transportation. The vegetable products are abacá, camotes (sweet potatoes), coffee, sugar cane, tobacco, palay, indigo, and corn. Cattle raising is an important industry. Grazing lands are abundant, and the cattle of this district have never been attacked with either surra or rinderpest.

ABACA IN DAVAO.—The District of Davao has every promise of becoming one of the most important abacá producing centers in the Philippine Islands. The amount of available land is almost unlimited, the soil is fertile, the climate is extremely favorable for hemp cultivation, and the local conditions with respect to labor, working animals, water supply, transportation, and markets are reasonably good. The abacá industry in this district is as yet in its infancy. Fiber has been produced only during the past 12 or 15 yrs. At the present time large plantings are being made, while the favorable conditions and the general interest which is being shown in this part of the country indicate that a remarkable development will follow during the next few years.

CLIMATIC CONDITIONS.—The first and most important requirement for successful *abacá* cultivation is an abundant supply of moisture. One long dry season will seriously damage or may entirely destroy a hemp plantation. In Davao the rainfall is heavy and is quite evenly distributed throughout the year, the average for 2 yrs. showing 187 days of rain with a precipitation of 79.82 ins. There is, also, a very high degree of atmospheric humidity, indicated by the heavy dews and the long time required to dry hemp after it has been stripped. The structure of the abacá plant and its habits of growth are such that this condition of atmospheric humidity has almost as important a bearing upon its development as does the amount of rainfall. Davao is S. of the typhoon district, and the heavy windstorms which occasionally do so much damage to abacá in other localities, seldom occur in SE. Mindanao.

SOIL CONDITIONS.—The soil requirements for abacá are a rich deep loam, moist, well-drained, containing a large quantity of organic matter, and of volcanic origin. Soils of this character are to be found in nearly all parts of Davao. In S. Luzon and the Visayan Islands we usually find abacá planted on sloping land, thus securing the good drainage particularly required in the rainy season. In Davao, however, the greater part of the abacá plantings have been made on level land. This is probably due, in part, to the fact that the level lands near the sea coast and in the river valleys have formerly been cleared of their timber by the native tribes and are, therefore, more easily put under cultivation than the heavily timbered lands on the mountain slopes. Owing to the even distribution of rainfall these level lands do not become sufficiently wet at any season of the year as to retard the growth of the plant, while they have the advantage of being more easily worked than the mountain lands.

LABOR.—The labor question in Davao, both as regards the amount of labor available and the quality, is by no means satisfactory. The principal labor used on the plantations is that furnished by the native tribes. With a little more encouragement these people will settle on the plantations, and after some preliminary training they make fairly satisfactory laborers. The wage is 50 centavos (25c gold) per day, and this is usually paid in rice, cloth, beads, or some other commodity. As long as the number of plantations in the district was small the question of labor was not a serious one, but the large influx of American planters during the past 2 yrs. has brought about a condition of affairs that now makes it imperative that outside labor be brought into the district. Several planters have already imported Visayan and Japanese labor, and with future development the use of such labor will probably become more general.

VARIETIES OF ABACA.—A number of different varieties of abacá are planted in Davao, there being considerable difference of opinion as to their relative merits. The most important of these varieties are as follows:— (1) Magnindanao; stem short and thick; fiber good quality; age 15 yrs..; (2) Tangonon; stem long and thick; fiber coarse, resistent and neavy; age 15 yrs.; (3) Putian; fiber white and non-resistent; age 12 yrs.; (4) Libuton; stem short and small; fiber dark and resistent; age 15 yrs.; (5) Baguisanon; stem very long; fiber weak; (6) Putian baguisan; stem short and small; fiber white and fine, but not abundant; age 10 to 12 yrs ; (7) Lana-an; stem long and thick; fiber abundant and resistent.

PLANTATIONS.—The Davao plantations are located along the coast, principally S. of the Town of Davao. In selecting locations the two questions that have received first consideration have been the supply of labor available and the facilities for transportation. The management of the Davao plantations is worthy of the highest commendation. The Americans who have settled in this district are keeping their plantations in excellent condition, and are experimenting along various lines with a view of introducing new crops and of improving methods of cultivation.

PREPARATION OF THE LAND.—The first work of the abacá planter is to clear the land of all trees and undergrowth. This material is allowed to remain on the ground until fairly dry and is then burned. As soon as practicable after this burning, camote plants are set out, and when these plants have obtained a start the abacá is planted. In some cases the land is first plowed and harrowed, but as newly-cleared land is usually rough and filled with stumps, and as animals and implements are scarce, this system is not generally followed.

PLANTING.—Abacá may be planted in Davao at almost any time during the year, but the most favorable time is during the rainy season. In planting lither suckers are used, or a portion of the root of an old plant. The suckers used are all obtained within the district and the supply is barely sufficient to meet the demand, the local price for suckers being from ₱20 to ₱40 per thousand. Plantings are made in straight rows from 9 to 12′ apart each way, ordinarily 10′, which gives approximately 1,000 plants to the hectare. Camotes are usually grown in the same fields with abacá. There camotes grow rapidly and in a short space of time entirely cover the ground, thus checking the growth of weeds. They also furnish a good supply for the laborers on the plantation. Many of the Davao planters are planting cocoanuts with abacá. Every third plant is left out and a cocoanut planted in its place. Where the land thus planted is adapted to both abacá and cocoanuts this system is one to be recommended.

CULTIVATION.—Where abacá land is plowed before being planted and is afterwards worked with animals, almost constant cultivation is required during the year to keep down the growth of weeds. When camotes are planted the growth of weeds will not be so great, but even under these conditions a clearing is neces-

STRIPPING HEMP BY HAND

sary every 2 or 3 mos. After the abacá is full grown so as to shade the ground, and after the shipping of fiber has left a large amount of refuse on the land, the growth of weeds will die out.

HARVESTING.—Throughout the N. and central islands the first cutting of abacá takes place at 2½ to 3 yrs. after planting. In Davao good abacá had been cut at 20 mos. and the first cutting is ordinarily made within 2 yrs. after planting. This rapid development is due to favorable climatic conditions. There being no well-marked dry season, the growth of the plant is not checked at any time during the year. Subsequent cuttings are made every 6 to 9 mos. This rapid growth and early development are important considerations and are quite sufficient to show that the climatic and soil conditions of Davao are particularly well suited to the cultivation of abacá.

EXTRACTION OF FIBER.—The fiber is extracted, or stripped, both with smooth-edge and the serrated stripping knives. A very decided stand has been taken by the American planters of the District of Davao to maintain and improve the quality of the fiber exported, and an effort is being made to bring about a more general use of the smooth-edged stripping knife.

AFTER-TREATMENT OF FIBER.—The fiber, after being stripped, is hung over bamboo poles and is dried in the sun. This drying takes about two days in Davao, a longer time than in localities where the degree of humidity is not so great. From the plantations the fiber is sent, either in small boats or on native ponies, to some point of shipment. The greater part of the product of the district is shipped from the Town of Davao direct to Manila.

DAVAO FIBER.—The fiber produced in Davao is of remarkably good quality. In length it is probably superior as a whole to the product of any other district or province in the Philippine Islands. In color and fineness it ranks well, but with respect to these two qualities might be improved by a system of classification and a more restricted use of the serrated knife. The yield per hectare, under normal conditions will probably average from 12 to 16 piculs. The usual selling price of abacá in Davao is from ₱20 to ₱24 per picul. A small amount of fiber is used locally for the manufacture of cloth.

CONCLUSION.—With favorable climatic conditions and large areas of undeveloped land, the future of abacá in Davao depends chiefly on the rapidity with which the public lands are taken up and developed. With improved facilities of communication and transportation, the present somewhat isolated condition of this district will in a measure be removed. The efforts which are being made, both by the planters and by the government officials, to encourage the introduction of agricultural machinery, to improve labor conditions, and to perfect the methods of cultivation and fiber extraction, together with the natural richness of the country itself, should result in making this district one of the richest and most important agricultural sections in the Philippine Islands.

OIL FIELDS OF TAYABAS

What promises to be one of the greatest oil fields of the East has been discovered in the Province of Tayabas, in the southern extremity of the island of Luzon. It has long been known to the natives that crude oil existed in this part of the Philippines, but no attempt had been made to develop the outcroppings under the Spanish régime. It remained for the coming of the American forces, amongst whom were men thoroughly familiar with the oil fields of Pennsylvania and Texas, to have the full importance of the new field recognized and an effort made to carry on development work.

The oil lands lie in the Bayhay River valley, approximately three and one half miles from the port of San Narciso on the Ragay Gulf of the Tayabas peninsula. The oil as it was first discovered was observed seeping up from the river bed, these outcroppings appearing in many places on the surface of the river. Samples were originally obtained by impounding a small place in the river bed and digging up the gravel and sand inside the inclosure and then skimming the oil off with a tin plate or other small dish. Major J. B. Murphy of the Philippines Constabulary, one of the parties interested in the claims which have since been filed in the Insular Mining Bureau, has taken as many as a dozen samples in this manner varying in size from a quart to a gallon each, as the result of a day's work, in which two or three men were employed. At the point on the Bayhay River where these samples were obtained, gas bubbles are constantly rising in midstream, bringing an efflorescent film of oil with each bubble and throwing off a strong petroleum odor. Near the shore line opposite this point about twenty feet distant from where the samples are usually gathered, the crude oil may be obtained in solid bubbles, by simply stirring the gravel with a rod or iron bar. On first arising to the surface the oil varies in size from a small pea to a drop big enough to fill a teaspoon, the color varying from a dark green to red.

From these preliminary prospects which on analysis proved that the indications pointed to a high grade of oil, the interested parties have pushed forward their work on a more extensive scale. The Tayabas Mutual Oil Association was organized, with Mr. E. W. McDaniel as Managing Director, and prospecting work carried on in a more efficient manner.

Under the supervision of Mr. McDaniel, drilling has been commenced, and a hole sunk to the depth of 127 feet, using a 3¾″×2½″×3′ bit operated by a hand power spring pole and duplex block attachment.

The first oil sand occurred at a depth of 62 feet and continued through six feet to a depth of 68 feet. From this strata using the mud bailer as a pump, 46 gallons of crude oil of an excellent quality was secured in one day's work, and samples sent to the Government Laboratory at Manila for analysis. The analysis is given at the conclusion of this article. Owing to the crumbling nature of the formation above and below, this oil bearing strata was cased out and the well drilled to its present depth of 127 feet and the casing extended down to 103 feet. The second oil strata was found at a depth of 117 feet extending downward 5 feet or to a depth of 122 feet. The yield of oil at this depth was practically the same as that of the first strata, but a satisfactory pumping test could not be carried out with the mud bailer, there being no other appliance at hand.

From hydrometer tests made in the field by Mr. McDaniel with thermometer at 32C and clear water specific gravity at .999⁵ the sample of crude petroleum from the 62 foot depth showed a specific gravity of .803. A sample of petroleum from a can of the Comet brand at the same time showed a specific gravity of .800⁵. Sample of oil from the 127 foot depth, with thermometer at 28C, the specific gravity was .803 and a sample of petroleum from a different can of the Comet Brand at the same time was .801.

An analysis of the oil from the Bayhay field (the sample being taken from the 62′ stratum) made by the Bureau of Science, Government Laboratory in Manila, during April 1906, shows the following report on analysis of crude petroleum. Specific gravity of original sample 30° fractional distillation.

A 90°-150° C=6% of 49° Bl.
B 150°-300° C=67.5% (B Refractionated.)
B I 150°-185° C=20% of 44° Bl.
B II 185°-250° C=28.5% 35° Bl.
B III 250°-300° C=19% of 27° Bl.

C. Fraction not boiling at 300° C was redistilled in vacuum, (6 to 8 mm pressure.)
170°-300° C=23% of 18° Bl. %
D Residue of tar, etc.=3%
(Signed) Herbert S Walker, Analyst.

In a number of burning tests with a small tin lamp without chimney or globe, in an open room, the lamp holding 1½ gills fitted with a 3mm. wick the oil burned for six hours without refilling.

The accessibility of the field and the absence of any great transportation problem for its development, mark it as a most desirable enterprise for capital.

The field is in an uninhabited part of the country and may be reached by boat anchoring off Point Bayhay, Tayabas Peninsula, in Ragay Gulf, and proceeding inland by trail four miles to the camp house and well near the southern boundary.

There will be no unusual or difficult features to be encountered in the building of a road and pipe line from the sea coast to the Bayhay oil field. The general contour of the valley along the Bayhay River is fairly level, reaching an elevation in the vicinity of the first well four miles from the sea coast of 140 feet above sea level.

The river which passes through claims, carried by measurement 2220 cubic feet of water per minute, during the rainy season, the stream being in a normal condition. Another measurement made during the extreme drought of 1903 measured 1180 cubic feet per minute.

All claims that have been registered in the vicinity are situated in the Bayhay river valley in a basin two and one half miles in length by one half to one mile in width; the oil crop is well toward the south end of basin between first and second range from coast of Ragay Gulf. The elevation of river bed at oil outcrop is one hundred and forty feet, measurement made by compensated aneroid under different degrees of temperature, 170 feet being the mean on all sides of basin and valley. The low mountain ranges attain an elevation of five to nine hundred feet.

The most practical route to reach the center and southern point of the field is through the river valley, starting at a point on Ragay Gulf about five hundred feet east of mouth of Bayhay river, following the valley through mountain pass of first range foot hills. Either road or pipe line may be constructed very easily and at moderate cost for road. Stone ballast is abundant, the ground firm and compact, and no bridging necessary, the banks of all the small streams being low and the

BOGOBO LABORERS PLANTING HEMP ON MESSRS. KELLER & GOHN'S PLANTATION AT SANTA CRUZ; LATTERS' STORE AND RESIDENCE

TAYABAS OIL FIELDS:—VIEW ON BAYHAY RIVER AT POINT OF OIL OUTCROPPINGS

COMPANY FOR ZAMBOANGA

Mr. Harold Gibson of San Francisco, local manager of the Mindanao Plantation Company, is in Zamboanga preparing to open up head-quarters for farm and road machinery, and heavy hardware.

Through their connections in America they will doubtless be able to interest considerable capital in agriculture in this Province, which it is their intention to do.

The company is capitalized at $100,000, $50,000 of which has been paid in and $25,000 additional subscribed.—"*Mindanao Herald.*"

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SINGAPORE-KRANJI RAILWAY:—MR. J. H Williams, resident engineer to the Singapore-Kranji railway, has issued his report for 1905. One and a quarter of the permanent way was laid, and some fencing constructed; the station near the Borneo Wharf was completed, and the Tank Road Station; 18 wagons and a brake van were received and erected, and a tank engine contracted for. To the report is appended a financial statement. The estimate for the extension, inclusive of additional works, was $1,438,627; and of this, by the 31st of December last, $1,029,285 was expended, leaving a balance of $409,341. The amount voted on the original estimate for the year 1905 was $600,000, but only $133,058 was spent. A balance of $166,941 remains of the amount voted for the extension works for 1905.

beds firm. Considerable timber and heavy underbrush is found along the river valley, while another large part of the valley is covered with a tall stiff grass from three to eight feet tall. A gravity pipe line may be laid very easily, barely necessitating more than the clearing of right of way sufficient to handle structural material. Stone and timber at hand may be had for cribbing purposes in immediate vicinity should an inverted syphon not be desired on pipe line. Anchorage near mouth of river, fifteen hundred feet from shore, carries three and one half fathoms.

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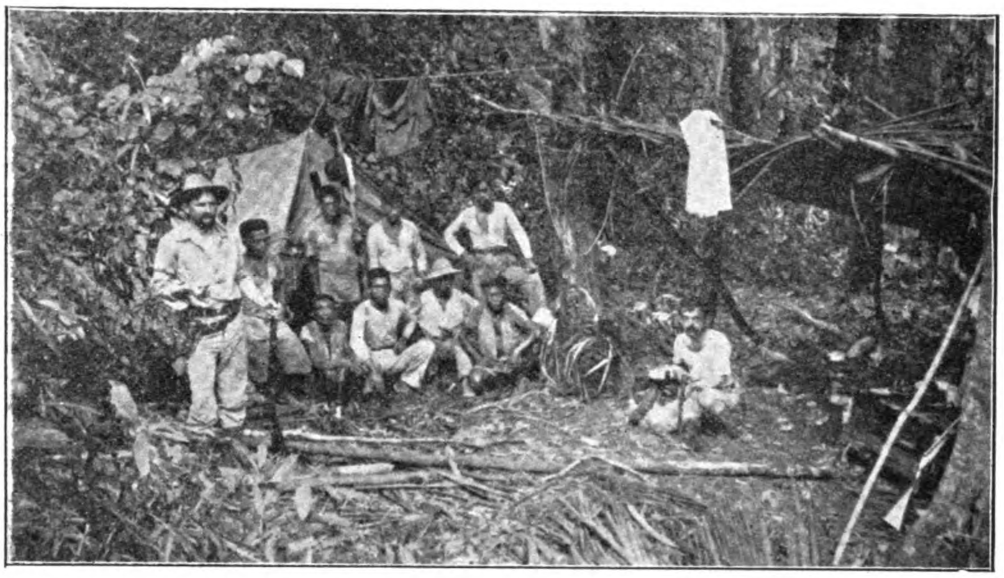
PIONEER FIBER DECORTICATING MACHINES

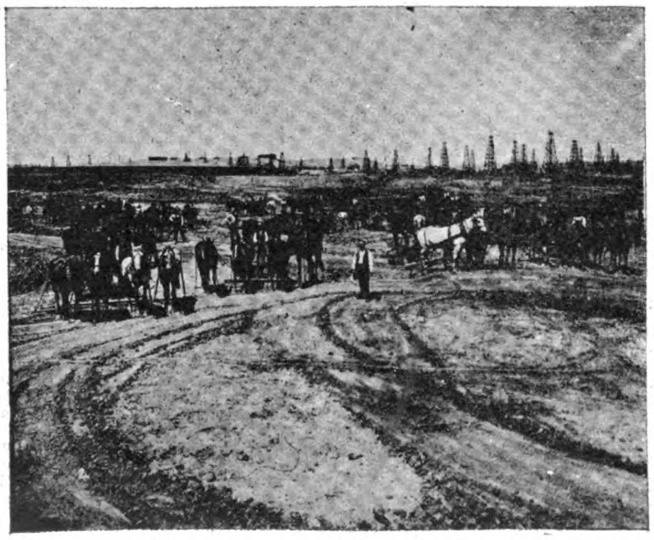
(Continued from page 81)

The curves are absolutely fixed, the scrapers can be adjusted to perfection to the proper diameter and the whole scraper-wheels can be approached to or withdrawn from the curve by means of set-screws with lock-nuts working on the base of the bearings, and can be lowered or lifted to perfect adjustment by means of set-screws with lock-nuts working on a wedge under the bearings. The bearings themselves are brass-boxes oscillating in their cast iron body and cap. The spaces between the scrapers on the drums are filled in with brass covers so that the scrapers only project about ¾-in. beyond the periphery formed by these covers. All parts of the machine coming in contact with the leaves, fibre or juice, are made of best composition, driving pinions of steel. The shaft, driving the grip-wheels from below, and the scraper-drums are driven independently from one counter shaft. The arrangement of light link-belt and sprocket-wheels is a conveyor for the purpose of insuring the second grip at the right time and place. The whole machine is mounted on a solid cast-iron bedplate, all stationary parts are heavy, insuring secure and perfect stability, free of trembling or vibration. The total weight of the machines is ten tons, or 20,000 lbs. The feed table is not shown in the cuts, but is furnished with every machine, also its driving sprocket-wheels and link-belt; movement is taken from the lower shaft.

Further information may be secured by writing to the Pioneer Iron Works, of Brooklyn, N. Y., U. S. A., or to Castle Bros.-Wolf & Sons of Manila.



TAYABAS OIL FIELDS:—VIEW ON BAYHAY RIVER AT POINT OF OIL OUTCROPPINGS



OIL FIELDS OF CALIFORNIA

CONSTRUCTION AND ENGINEERING NEWS

PORT WORKS, DREDGING ETC.

SINGAPORE HARBOR SCHEME:—The following memorandum on the tender of Sir John Jackson, Limited, for the Singapore Harbor improvements, was laid on the table of council at the end of last month. The tender which is recommended for acceptance is that of Sir John Jackson, Limited. This tender provides for the construction of the quay wall and reclamation at Telok Ayer, the West Mole at the southern end of the reclamation, the Inner South Mole, and for dredging the inner basin to a depth of 18ft. admitting of a depth of 20ft. hereafter by further dredging. The contract price provides for deepening the whole length of the inner basin a thousand feet wide from the side of the quay, fanned out at the ends to form convenient entrances. The lump sum tendered for carrying out these works is £1,030,693.

There are, however, certain works which will be necessary but are not included in the tender, such as laying out the roads on the reclamation and a railway on the quay, paving and lighting, laying on water, providing light-houses for the moles, etc. These works in accordance with the terms of the draft contract will have to be paid for according to schedule prices. The Consulting Engineers estimate the cost of these necessary works to be £70,000, and they recommend that an allowance should be made of five per cent on the contract price or £50,000 for extras which may arise during the execution of the contract. It is advisable to make a further allowance of five per cent on the cost of the works to cover supervision by the Engineer Staff and Inspectors in the Colony, and for the professional fees of the Consulting Engineers with their London Staff, and for passages, and also for visits of the Consulting Engineers. Taking the total cost of the works, including the works to be paid for according to schedule prices and possible extra works, at £1,150,693, five per cent on this amount will be £57,535. This will cover all charges from the date of the contract. The Crown Agents have not arranged any terms with the Consulting Engineers but it is proposed to leave the terms to be settled after consultation with His Excellency the Governor during his approaching visit to England. A further addition of £3,500 must be made to cover the charges of the Consulting Engineers, including Solicitors' fees and printing from February, 1904, to the date of the contract. The draft contract provides for taking materials from Mount Wallich for the top filling on the proposed reclamation, and it is understood that the tender has been made on the understanding that the Contractor will be able to obtain sufficient materials without payment of royalty. Should there not be sufficient it will be necessary to obtain material elsewhere, the extra cost being borne by the Government. No estimate of the cost of this has been prepared. The amount already spent in connection with the proposed works, including preliminary surveys and reports and Consulting Engineers' fees, is about $94,000. *(Singapore Free Press.)*

CALCUTTA HARBOR:—Owing to the enormous expansion of trade and the increase in the size of vessels, the Calcutta Port Commissioners have been considering proposals for adding facilities to the port. These proposals necessitated the acquisition of large tracts of land, so that in the course of the next few years the appearance of much of Calcutta by the river will be altered almost beyond recognition.

Three miles above the floating bridge a plot of riverside land has been acquired for a jute station and moorings laid for jute vessels. The jetties immediately below the bridge, having become too small for the cargoes of modern steamers are now under reconstruction on a plan which will give three times as much shed-space and an extension of 1,150 feet besides the provision of very large watch-houses for imported goods.

With regard to the docks, a new berth with a quayage of 600 feet and increased covered storage of 89,000 square feet has recently been opened in the tidal basin, and four new general produce berths are in process of competition in dock No. 1. In dock No. 2 there will be added shortly two permanent berths with a coal-tipping plant and four new general produce berths will be built at the north end. On the Howrah bank a large portion of the Seebpur College estate has been purchased by the Port Commissioners from the Government of Bengal on which property depots are being prepared for the timber trade.

With regard to the export trade the growth has been so rapid that increased accommodation has to be provided without delay. The additions and improvements to the docks referred to will be sufficient for the probable growth of trade for several more years, but in order to make provision for the future the Port Commissioners deem it advisable to acquire a large area of land on which to construct three new large docks.

YOKOHAMA PUBLIC WORKS:—The expenditure of the city of Yokohama, which was only 100,000 yen in its early years, is estimated at over 1,100,000 yen for the present fiscal year; and there are indications that it will still further increase. The city, besides an outstanding loan of some two and a half million yen, is now going to raise three new loans. The first is a loan of three million yen for the improvement of harbor works, the second, some 200,000 Yen, for the construction of the City Office and the third, four and a half million Yen, for the enlargement of the water-works. These new loans will not be repaid by the money received from the works, to which they are to be devoted, but by means of new municipal taxes. When these facts are taken into consideration the burden of the inhabitants of Yokohama does not forebode to become lighter for some time to come.

KOBE HARBOR TRUST.

The Kobe Foreign Trade Investigation Society has formulated a scheme to establish a Harbor Trust in Kobe, with the object of generally improving and enlarging the present landing and shipping accommodation. Mr. Nishikawa, Secretary of the Society, recently visited Australia to investigate the Harbor Trust system at Sydney and Melbourne. Having now completed their plans, the Society has decided to address memorials to the Premier, the Ministers for Finance, Home Affairs, Communications, and Agriculture and Commerce, recommending that a harbor trust be organized in Kobe under a special decree. The Society suggests that all real estate and other property held in Kobe by the Government should be transferred to the Trust. Landed property, piers, godowns, and other property belonging to the local authorities and private companies should also be transferred or sold to the Trust, which should be authorized to impose and collect tonnage, wharfage, and all other dues, with the exception of Customs duties. For the administration of the Trust officials should be appointed, and an Advisory Board embracing members of the Municipal Council, Chamber of Commerce, and business men should be formed. All expenses of the Trust will under this scheme be paid out of the tonnage dues and other revenues mentioned. The Trust would also be authorized to raise loans or to issue bonds for funds required for carrying out the improvement of harbor accommodation. Briefly, the object of the Harbor Trust is to bring the port under the control of one authority, with the exception of the Customs, and to carry on the improvement of the harbor. The Society estimates the revenue and expenditure of the Harbor Trust for the first ten years, from 1907 to 1916, of its working as follows:—

EXPENDITURE.

1.—Cost of the improvement of the harbor, land and sea -Y-35,000,000:—	
a.—Large breakwaters, and docks....	-Y-10,000,000
b.—Piers....	19,000,000
c.—Godowns....	2,000,000
d.—Reclamation of sea-front, dredging, and stone walls....	4,000,000
2.—Purchase of private property....	5,000.000
3.—Machinery....	2,000,000
4.—Maintenance of property and works of the Trust....	1,500,000
5.—Reserve fund....	2,000,000
6.—Interest on bonds....	13,675,000
Total....	59,175,000

REVENUE.

1.—Proceeds from bonds....	-Y-45 000,000
2.—Wharfage....	16,178,666
3.—Tonnage dues....	2,615 509
4.—Docking charges....	815,217
5.—Godown rent....	3,022,968
6.—Crane hire....	743,226
Total....	-Y-68,880,589
Balance....	9,705,586

(Japan Chronicle.)

WHANGPOO CONSERVANCY BOARD:—An office for the Board has been established at No. 1, Kiukiang Road.

PIER, HONGKONG.—The right of erecting and maintaining a permanent pier over Crown foreshore in Hongkong will be sold by public auction at the office of the Public Works Department, on Monday, the 23rd day of July, at 3 p. m. The pier will be opposite Queen Victoria St., and be 200ft. by 20ft. The upset price is given as $12,000.

PIER, F. M. S.:—There is talk of the new Iron Swettenham Pier being extended another five hundred feet. At first ships seemed to fight rather shy of it, but now they seem to be getting to know that good wharf accommodation really exists here, for though in 1905 only about 150,000 packages were landed over the pier, we have already landed 107,000 in the first six months of this year. Its big crane makes the handling of heavy machinery a comparatively easy matter.

PORT WORKS, TAIREN:—In connection with the conversion of Tairen into a free port and the establishment of the South Manchurian Railway Company, it is stated that the Japanese Government has made arrangements to improve the jetty and provide other additional shipping facilities at that port. The expenditure is estimated at about -Y-20,000,000.

RECLAMATION, HONGKONG:—The huge scheme of improvement which is being carried out on Blackhead's Point, Kowloon, astonishes the visitor who was familiar with the sight of huge granite boulders and prominent hillocks. Hundreds of tons of earth have been cleared away by an army of coolies and dumped, with stone, etc., on the foreshore to form a foundation for the work of reclaiming Hunghom Bay, while masses of granite are being blasted each day for use in the erection of substantial buildings, etc.

PIER, MADRAS:—The Port Trust at Madras have obtained permission of the Government for the erection in the harbor of a strong modern pier fully equipped with quick modern hydraulic cranes. The Port Trust will pay this out of savings from revenue, which now amount to Rs. 9 lakhs and are increasing at the rate of Rs. 1.5 lakhs per year.

ELECTRIC LIGHT AND POWER

CALCUTTA TRAMWAYS:—The Calcutta Tramways Company have obtained a license from the Government of Bengal for purposes of supply of energy for electric traction within the Municipality of Howrah. The license has effect from Feb. 27, 1906. The option of purchasing the undertaking shall be accorded to the local authority and the local government on Jan. 1, 1931, and at the end of every subsequent period of seven years after that date. Three-phase current at a pressure of 6,600 volts shall be transmitted at a frequency of 25 cycles per second from the power station of the licensee located on the Lower Circular-road, Calcutta, to a sub-station located in Howrah by means of special duplicate three-core high-tension cables laid underground. In the sub-station the high tension alternating current will be transformed to continuous current at a pressure of 550 volts by means of static transformers and rotary converters. This continuous current will be distributed to various points along the system by means of underground cables, where they will feed into the overhead trolley wires, from which the motor cars will derive the necessary current. Both for high-tension transmission mains and the low-tension distributing mains will be laid in earthenware troughings filled with pitch, and, in the case of the former, a separate trough will be provided for each. Duplicate high-tension submarine cables will be laid under the Hooghly River to join the Calcutta mains with those of Howrah. It is proposed to instal the overhead trolley system, using steel poles for the support of the trolley wires, of which there will be two, one for each track. The size of the trolley wires will be 3/0 S. W. G. The overhead trolley line will be divided into half-mile sections, conforming to Government rules, and will be doubly insulated throughout. The sum to be deposited by the licensee shall be a sum equal to 10 per cent. of the probable outlay to be incurred by the licensee, but not exceeding Rs. 20,000 (£1,333).

DELHI TRAMWAYS:—The prospectus of the Delhi Electric Tramways and Lighting Company has just been issued in London, and an appeal is now being made for £140,000 in 6 per cent. preferred and participating shares at £1 each. Included on the Board of Directors are Colonel Sir Buchanan Scott, K. C. I. E., late Deputy Consulting Engineer for the Indian Railways, and John M. Campion, late Chief Engineer to the Public Works Department Punjaub. The prospectus states that the Company has been formed to construct a system of electric tramways in the Municipality of Delhi under an order proposed to be granted under the Indian Tramways Act. 1886, by the Government of the Punjaub, and to supply electric power for lighting and other purposes under the terms of a licence, called the Delhi (Municipality) Electric Licence of 1905, which has been granted by the Government of Punjaub. The business will be purchaseable by the local Government at the end of 42 years from 1905 or at intervals, subsequently, of every 10 years. The Company will acquire as a going concern the lighting installation which now supplies current to the Municipality for street lighting, to the Sadar railway station and a few private consumers. The engineers to the scheme, Messrs. Kincaid, Waller, Manville and Dawson, have issued a very favorable report, in which they state that the total capital of the undertaking, *viz.*, £170,000, is reasonable, and that a net profit of £15.000 per annum, subject to London Administration expenses, may be confidently anticipated which should pay a dividend of 9 per cent. Messrs. Bruce Peebes & Co., of London and Edinburgh, have entered into a contract for the construction and equipment of the whole installation, including tramways and power house. The first tramways to be constructed make a total of 7½ miles.

NEW ELECTRIC RAILWAYS, JAPAN:—Capitalists are now directing their attention to the construction of electric railways and the utilization of water power as highly promising investments, and these post-bellum activities resemble the railway mania after the Japan-China war. The electric railway "mania" is now in evidence, particularly in the neighborhood of Osaka. The latest development in this direction is the formation of a company to construct an electric line from Osaka to Mino, the maple resort, and from there to Takarazuka, by way of Ikeda, and thence to Namase and Arima. Other projects are from Takarazuka to Mikage, via Nishinomiya, and also from Iguchido to Ikeda. The capital of the company is fixed at -Y-500,000 in 90,000 shares, and application has been made to the

proper authorities for a charter. The style of the company is the Minomo-Arima Electric Railway Company, Limited. Seven thousand shares have been engaged by the promoters and the rest are to be placed on the market. It is estimated that on the opening of the whole line the company will be able to allot a dividend at the rate of 7½ per cent per annum. The line will be double throughout The section between Osaka and Ikeda will be first constructed and forty cars run from either end every day. Messrs Den Teikichi, Doi Michio, Murakami Koichi, Hiro Michisuke, and Hayami Taro of Osaka; Mr. Ikeda Kambei of Kobe, Mr. Yonesawa Kichijiro of Akashi, and Mr. Noda Utaro of Fukuoka Prefecture, are the promoters of the company.

ELECTRIC POWER SCHEME, INDIA:—A scheme for working both the Nilgiri railway and the Coonoor-Ootacamund extension thereof by electricity has been investigated by the Indian Government. The estimate is under consideration.

ELECTRIC PLANTS, MANCHURIA:—The Chinese-Japanese Commercial Society of Yingkow intends to build electrical works for which the amount of Taels 200,000 has been reserved. The machinery and accessories have been ordered at Tokio.

HYDRO-ELECTRIC SCHEME, MUSSOORIE:—The hydro-electric (water supply and lighting) scheme for Mussoorie, which is estimated to cost some Rs. 7,30,000, has been sanctioned by the Government and the necessary funds are being provided by means of a loan to the Mussoorie Municipal Board.

HANKOW ELECTRIC PLANT:—Surveyors are now at work on the Japanese Concession—It is stated that, notwithstanding reports to the contrary, the contractors have every confidence in their ability to complete the electric lighting installation by the middle of November, or at the latest the beginning of December.

KYOTO ELECTRIC RAILWAY:—The Kyoto Municipal Assembly have adopted a motion to purchase the City Electric Railway and conduct it as an underaking of the Municipality.

The Kyoto Electric Railway Company was formed in 1894 with a capital of -Y-1,200,000 of which -Y-950,000 was paid up last year. Between the half-years of 1903 and 1905 the dividend fell from 12 to 4 per cent.

HYDRO-ELECTRIC SCHEMES, JAPAN:—The development of electrical power has been aided largely by the 60 per cent. advance in the price of coal since the conclusion of the war, the largest concern thus far mentioned being the £2,000,000 Ujikawa Power Company, which will furnish the City of Kyoto and vicinity with electric motor power having a capacity of 40,000 h. p. The Hanshim Electric Railway, connecting Osaka and Kobe, will utilize water power for generating electricity, and another important Company is to be formed to supply Nagoya and its vicinity with electrical power.

WATERWORKS

WATERWORKS, KOREA:—Mr. Sano, Superintendent-Engineer of the Kobe Waterworks, has been appointed as Engineer in the Korean Residency-General to superintend the construction of waterworks in Korea. Mr. Sano's services will be retained as advisor to the Kobe Waterworks Office.

KOREAN WATERWORKS:—It is announced that the issue of 2,500 5 per cent. Korean Waterworks Debentures of £100 each, recently made having been fully subscribed, the company's consulting engineers, Messrs. Livesey, Son, and Henderson, have received instructions from the directors to send a resident engineer to Soul to take charge of the works.

WATER WORKS, MADRAS:—The Madras Government are making a loan of Rs. 91,000 under the Local Authorities Loans Act 1879 to the Nellore Municipality towards the execution of their water supply scheme which is estimated to cost Rs. 1,81,000. The loan which is being taken for a period of thirty years will carry interest at the rate of 4 per cent per annum.

POONA WATER SCHEME, BOMBAY, MAY 18:—At a meeting of the City Municipality held yesterday evening, the Poona water scheme, was unanimously adopted. The scheme put forward by the Sanitary Engineer, includes settling reservoirs, holding about eight days' supply for the whole city; raised water reservoirs on the Parwati Hill side, to hold 10 lakhs of gallons, pumping supply in twelve hours; providing cast-iron mains to Parwati, Shankerpet and Lalbagh; distribution mains, and the mains to be capable of giving the required supply for distribution in the whole city of 24 lakh gallons in 8 out of 10 hours. The cost of the scheme is Rs. 4,22,000.

THE OSAKA WATER-WORKS:—Owing to the rapid growth of the population of Osaka, the capacity of the city water-works is becoming inadequate. The municipal authorities are contemplating an extension, and four plans have been drawn up. The first of these proposes to enlarge the existing intake, to construct additional filter-beds and delivery-pumps, and to extend the main (350 miles) by 80 miles, supplying water for a population of 1,200,000. The cost of the work is estimated at -Y-6,900 600. The second scheme proposes to extend the reservoir in the grounds of Osaka Castle, also supplying water for a population of 1,200,000, at the estimated cost of -Y-5,488,069. The third proposal is to construct a reservoir at Uye-Hommachi, 125 feet above sea-level, capable of supplying water for a population of 1,500,000. This plan proposes to extend the mains by 125 miles as the city expands, and the cost is estimated at -Y-9,562,020. The fourth scheme is the most remarkable. It is proposed to draw water from Lake Biwa to supply a population of 2,000,000, to construct reservoirs and filter-beds at Anju, Yamashina, near Kyoto, and thence to take the water through pipes to Osaka along the River Yodo, a distance of about 36 miles. Thirteen reservoirs are proposed to be constructed at Uye-Hommachi, 125 feet above sea-level, the reservoirs holding 243,500 koku or about 9,740,000 gallons. The mains will be lengthened by 200 miles, as the growth of the city may require. The cost of this scheme is estimated at -Y-28,700,000. In this latter project Osaka is following the lead of the great cities of England, which as local supplies became exhausted were compelled at enormous expense to draw their supplies from the Welsh hills and other ranges.

DOCKYARDS, SHIPBUILDING

NEW SANYO STEAMER:—The construction of the Sanyo Railway Company's steamship *Tsushima Maru* has just been completed, and she has been placed on the Shimonoseki-Fusan service since the 1st inst.

KAWASAKI DOCKYARD:—*N. C. D. News* has good authority for stating that the Kawasaki Dock Company have no intention of starting operations at Shanghai. Land was purchased with that intention, but the scheme has been dropped.

NEW STEAMSHIP LINES.—A Russian navigation company has started a regular service between Vladivostock and Hankow and Yangtsze ports with four large steamers. A new Belgian shipping company has been formed at Antwerp for running a line of steamers to China. The capital is Fcs. 25,000,000.

MITSU BISHI DOCKYARD:—The Mitsu Bishi Dockyard and Engine Works, Nagasaki, have received an order for a second steamer from the Japan Volunteer Fleet Association. The new vessel will be similar to the one now in course of construction at the Dockyard, being of 3,000 tons displacement and 21 knots speed.

TANJONG PAGAR, AWARD:—The award in connection with the Tanjong Pagar Dock is as follows:—

$27,929,177.00, for Company's Undertaking: $351,854.21, for Land for Railway Extension to Docks: see Schedule D of Report of Tomlinson & Maclaren: £220-10-0, for Annuity to Fraser; £6,919-4-5, for Compensation to London Committee; $418.937, for Cost of Reinvestment; $37,865, for Cost of Liquidation.

Commenting on the award the same journal remarks:—The Award $27,929,177 (about $754 80 per share), is about a third of the amount claimed by the Dock Company's Shareholders; it may or may not include the price paid for the Surplus Lands but certainly does not include the Dividend for the half-year ended the 30th of June, 1905, which wat large, and for which the Government declined so hold themselves liable to that extent.—(*Straits Times*.)

NEW DRY DOCKS FOR JAPAN:—Vice-Consul C. S. Leavenworth, of Nagasaki, reports another enterprise for Japan in the proposed construction of large dry docks at Tanoura, near Moji.

It is reported that a syndicate of Japanese and English capitalists is to build the docks. The amount of capital at first planned was $1,250,000, which was increased to $1 500 000, and it is said that $1,000,000 more may be added. Two docks are to be constructed, the smaller to be 480 feet in length, 60 feet in breadth at bottom, and 28 feet in depth and the larger dock to be 600 feet in length, 75 feet in breadth at bottom, and 30 feet in depth. There is some talk, however, that the No. 2 dock will be finally constructed with a length of 800 feet. The work is to be commenced within sixty days from the date of permission and is to be finished in twenty-four months.

LIGHTERS FOR MANILA:—A number of large lighters contracted for by Manila firms are reported as under construction at Hongkong, by a Chinese shipbuilder named Ah King.

One of the lighters has already arrived at this port. The craft is intended for use by the Quartermaster's department.

It is understood that the construction of the vessels has been let through Messrs. Michael of this city and J. I. Gonzales de Bernedo of Hongkong.

Ah King had a contract for three sister craft, one of which has been finished and is now being worked in Manila, the second was launched last week, and the third is being laid down. All will displace 250 tons and measure 100 feet in length, 24 feet in breath, and 8 feet in depth. A house 24 feet long and 8 feet wide occupies the deck. The craft have been staunchly built of yacal and teak timber.

MISCELLANEOUS

FLOUR MILLS, MANCHURIA:—A Consular report just issued from Washington states that recently no fewer than 30 flour mills for dealing with Manchurian wheat were shipped out of Japan to Port Arthur, one of these was made in the United States and twenty-nine—just like the American model—were made in Japanese shops. In Japan an unskilled laborer only gets about 7½d, and the highest skilled laborer 2s. for a twelve-hour day.

GREEN ISLAND CEMENT CO. of Hongkong has just purchased at auction in Hongkong a large cement mill which was destined for Vladivostok during the war.—The new mill cost £30,000 in England and was purchased at $212,000 mexican.—The new mill will be installed immediately along with the present cement works at Kowloon.—The monthly capacity of Green Island works will, in consequence, be increased from 60,000 bbls. monthly to 125,000 bbls. per month.

COTTON IN COREA:—Some members of the Japanese House of Representatives recently visited Korea specially to study the question of cotton culture. They have returned to Tokyo, and report that the prospect is hopeful. They assert that, at a moderate estimate, the annual crop will be worth about $40,000,000. Japan at present imports yearly from India and elsewhere cotton to the value of $56,000,000, and should this forecast of the Korean production be correct, it will constitute a formidable menace to those who at present supply cotton to Japan and the Far East.

ALLEN RIVETERS FOR MANILA, P. I.:—John F. Allen, 370-372 Gerard Avenue, New York City, has recently shipped to Manila, P. I., three large Allen riveters of 72″ reach, on order of the Atlantic, Gulf & Pacific Company for pipe work contract which this firm has secured there.

The shipment is just one-half the order, the balance of which will go forward in about two weeks.

The machines will average about five rivets per minute, and five other makers of Riveting Machines figured on the order, which was placed solely on the reputation the Allen tools enjoy, notwithstanding the price was not the lowest.

COTTON MILLS, ICHANG:—The British consul at Ichang, China, reports the recent establishment of a cotton mill there for the manufacture of cloth from Chinese yarn. The syndicate of local gentry who control the mill imported all the machinery, consisting of 50 wooden hand looms from Japan, and a Japanese manager has now been appointed, under whom steam looms are to be introduced. The cloth is produced in two widths, 15 inches and 14 inches; lengths vary; price 3½ cents gold per yard plain white, 4 cents per yard dyed black. It is in great demand locally as clothing material, and is preferred to the Shasi cloth, which, if the venture proves successful, it will doubtless supplant in the Ssuch'uan markets.

THE RUSSO-CHINESE BANK:—This bank in St. Petersburg has decided to declare a dividend of 10 per cent. for 1905, as compared with the one of 4 per cent. paid the year before. Out of the year's profits a sum of 2,000,000 roubles (£200,000) will be devoted to the purchase of silver in order to reinforce the bank's stock at Shanghai. The balance-sheet also contains a statement of the amount to which the Chinese Government is interested in the institution and which is now returned as at 7,562,400 roubles (£756, 240). It was now further decided to increase the share capital of the Bank from 15,000,000 roubles (£1,500,000) to 22,500,000 roubles (£2,250,000). According to advices from St. Petersburg, the Japanese Government has consented to return to the Bank the books and accounts confiscated at Port Arthur, the loss of which had hitherto prevented the Bank from settling with its clients.

HANKOW IMPROVEMENTS:—Building at Hankow by foreigners and Japanese is now active in the concessions and neighborhood. The viceroy is building a macadamized road along the old defense wall. A British firm has obtained authority to install electric-light works in the concessions, but the Chinese authorities refuse to let them do anything in the native town. The viceroy engaged a British engineer to examine and report on waterworks for Hankow, which the viceroy proposes to carry out by a joint stock company registered at the Chinese board under Chinese commercial law. In fact, the Chinese authorities are showing a determined disposition to "recover China's resources of profit and power" by curtailing to the utmost the rights granted to foreigners by treaties.

The export of tobacco has assumed considerable dimensions. The viceroy is starting an experimental estate and sheds for improving and curing, with the ultimate intention of establishing a cigarette factory. A British merehant is entrusted with the supervision of the enterprise, and is to engage an overseer from Manila. The railway now runs through to Peking, and, the consul adds, is doing a good business.

SAWMILLS:—Consular Agent E. J. King reports from Hakodate that the development of the railway-tie business in northern Japan should prove a good opportunity for the sale of American sawmill and other wood-working machinery. Mr. King writes:

American railway ties have been shut out of China by the cheaper hardwood ties from Japan. The latter have mostly been hand hewn, but machinery is now being introduced, and quite a number of small steam sawmills are now working. A new impetus has been given to the exportation of Japanese railway ties by the demand from the west coast of Mexico, where they will again come into competition with American ties. Already one shipment of 83,000 ties has left Hakodate for Guaymas, Mexico, and arrangements are being made to ship 700,000 ties this year. They are delivered in Mexico for 56 cents gold each The most of the sawmill machinery now used on the island of Hokkaido is English make, and American manufacturers of band and circular saws and of other woodworking machinery would do well to pay some attention to this trade opening. For their benefit I submit a list of names and addresses of some of the principal users of woodworking machinery: Riuyemon Zaimoku Kaisha, Hakodate; The Mitsui Bussan Kaisha and the Teshiwo Zaimoku Kaisha, Sapporo; The Hayakita Zaimoku Kaisha, Hayakita, and Mororan Mokuzai Kaisha, Mororan, all on Hokkaido Island, Japan.

OIL-WELL APPARATUS:—The Hoko Petroleum Company, of Echigo, Japan, has been organized to absorb the small, primitive petroleum wells in Echigo district, and will purchase up-to date equipments.

BEET SUGAR IN HUPEH:—We learn from good authority that Viceroy Chang Chih-tung is making arrangements for the growing of sugar beet in Hupeh on a large scale. If successful, H. E. intends to erect a large plant for the manufacture of beet sugar.

SAW MILL, CHINKIANG:—A certain Japanese syndicate is endeavoring to obtain permission for the building of a sawmill at Chenkiang, but it is reported that the building of such an establishment is objected to by the Taotai on the ground that no such permission has ever been granted before.

RAILROAD, MANILA, P. I.:—The Manila Railroad Co. has been incorporated in New Jersey with a capital stock of $100,000, to build and operate lines in the Philippine Islands. The incorporators are Richard Schuster, 21-26 Pine St., New York; Walter F. Taylor, 54 Wall St., New York, and James Rattray, Hasbrouck Heights, N. J.

RAILWAY CARRIAGES FOR CHINA.—During the visit of Duke Tsai Tse and his fellow Commissioners to the manufacturing centres in the Midlands and north of England, they inspected at Birmingham the railway carriages which are being built by the Metropolitan Amalgamated Carriage and Waggon Company for the Shanghai and Nanking Railway.

SOAP FACTORY:—A soap factory has also been opened, comprising two boilers each of 2,000 liters and a third of 6,000 liters, molding room and cutting room and a further room for the manufacture of toilet soap. Boilers and electric appliances have been supplied locally, but the principal part of the machinery was supplied by a Dresden firm.

STEEL, OLONGAPO, P. I.:—Bids are asked until July 24 by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for 18 riveted steel trusses, weighing about 35,000 lbs., and 192 channel purlins, weighing about 21,000 lbs., and ferroinclave steel roofing, sufficient to cover 11,000 sq. ft., for the roof of building No 3, at the Naval Station, Olongapo, P. I.—H. T. B. Harris, Paymaster-Gen., U. S. N.

GERMAN MACHINERY IN CHINA. GLASS FACTORY:—Germans are pushing industrial undertakings in the Shantung Peninsula of China. According to the British consul at Chefoo, it appears that a glass factory has been established at Poshan, on a branch of the Tsingtau-Cinan Fu Railway, equipped entirely with German machinery. The governor of the province furnished 15,000 taels and a Tientsin firm 10,000 taels toward the project.

THE TOKYO GASSED YARN SPINNING CO:—The representatives of the Tokyo Gassed Yarn Spinning Co. and the Fuji Cotton Spinning Co. are negotiating with the intention of amalgamating. The Tokyo Stock Exchange has consequently stopped business in the shares of both companies for delivery in July.

The Osaka Shosen Kaisha has applied to the Industrial Bank of Japan to borrow a foreign loan of 10,000,000 yen.

MANILA RAILWAY CO.:—The traffic receipts of the Manila Railway for the week ending 23rd inst. were $31,343, against $34,817 for the corresponding week of 1905, making an aggregate of $897,548 against $884,080 for last year.

The Deutsch-Asiatische Bank has opened new branches at Kobé and Singapore.

The Klang (Malay) Rubber Company has been registered with a capital of £20,000 in £1 shares, to take up an agreement with R. Laidlaw and A. F. Lake.

SUGAR REFINERY:—A sugar refinery is also to be established at Tsingtau which, it is anticipated, will put an end to the monopoly enjoyed hitherto in northern China by the two English refineries in Hongkong. The daily output is estimated at 200 tons, requiring about 80,000 tons of raw sugar annually from Netherlands, India, and the Philippine Islands. A considerable increase is expected in the number of vessels visiting Tsingtau Harbor; moreover, the Sangtung Mining Company should benefit from the larger demand for coal.

NEW BUILDING, TIENTSIN:—A steady transformation is beginning to be made in the Rue de France, the main street in the French Concession. One of the more important of the new stores about to be built is that of Messrs. Ullmann and Company, jewellers. It will have a frontage of twenty-two metres with four show windows, next door to Messrs. Mondon and Company, and opposite the American Trading Company. It is expected to be completed about the end of this year. The foundations have just been laid. The designs are by Messrs. Carrey and Conversy, the French Architects.

IRON BRIDGE, SIAM:—Mr. Hamilton King, minister to Siam, forwards from Bangkok a preliminary set of specifications and blueprints of tenders for a railway bridge for the Royal Siamese Railway. These can be secured by American bridge contractors from the Bureau of Manufactures. The time is short, and it is necessary that a cablegram be sent within two weeks if any firms will bid and submit plans for the contract. The Department of State has cabled Minister King at Bangkok that one or more parties of the United States will probably make tenders. Mr. King writes:

This is the first time it has been possible to get an open tender on bridges from the railway department, this being the first bridge of such dimensions as would warrant competition since the efforts for open tenders for railway material in general won out two or three years ago. Previously the Germans furnished all railway supplies. Since then they have not secured a contract. It is to be hoped that American firms can be found to bid on this bridge contract, as the removal of this contention throws the entire railway supplies of Siam open to public tender.

The bridge is to span the Menam River, with a single track of 1.485 m. gauge, and designed to carry the heaviest goods train. Delivery of material has to be made six months after the order has been given, which will be awarded by L. Weiler, director-general of the railways, presumably in November, bids being opened October 1.

MUNICIPAL NOTIFICATION, SHANGHAI:—The Council invites tenders for the construction and erection of two steel girder bridges across the Soochow Creek to replace the present Garden Bridge and Chekiang Road Bridge.

The Garden Bridge will consist of two spans, each of 171 feet and having a width of 60 feet between parapets.

The Chekiang Road Bridge will be one span of 196 feet with a width of 40 feet between parapets.

General conditions, specifications, drawings, forms of tender, and all other information may be obtained at the office of the Municipal Engineer, Mr. Charles Mayne, M. Inst. C. E., No. 15, Hankow Road.

A charge of Tls. 100 will be made for the specification and set of drawings, which will be returned upon the receipt of a bona-fide tender.

Sealed tenders, separately for each bridge, and endorsed "Garden Bridge" or "Chekiang Road Bridge," will be received by the undersigned not later than noon on Saturday, 3rd November, 1906.

The Council does not bind itself to accept the lowest or any tender, or to refund any expenses incurred in tendering.

By Order,

W. E. LEVESON,

Secretary.

Council Room,
Shanghai, 3rd July, 1906.

PROPOSAL FOR FURNISHING SEWER GATE AND SLUICE GATES FOR SEWERAGE SYSTEM—OFFICE OF THE MUNICIPAL BOARD.—Manila, P. I., May 5, 1906.—Sealed bids or proposals will be received until 12 m. September 12, 1906, for furnishing and delivering at ship's side in Manila, P. I., sewer gates and sluice gates for use in the proposed sewerage system of the city, in accordance with the plans and specifications on file in the office of said board. The total number of gates proposed for use by the city amounts to 413, ranging in size from 8 inches to 20 inches in diameter.

Each proposal must be accompanied by a certified check for $1,000, drawn on a bank established in Manila, and made payable to the Municipal Board of the city of Manila. For the convenience of bidders in the United States, said check may be deposited with the Bureau of Insular Affairs at Washington, D. C., in which event it may be drawn on a Washington or New York bank.

Specifications, instructions to bidders, general plans, and blank forms of proposals may be obtained at the office of the Board, Manila, P. I., or the Bureau of Insular Affairs, Washington, D. C.

The right is reserved to reject any or all bids.—JOHN M. TUTHER, Secretary of the Municipal Board.—J. F. CASE, Chief Engineer.

ADVERTISEMENTS OFFICE OF THE MUNICIPAL BOARD.—MANILA, P. I., MARCH 15, 1906.—Sealed bids or proposals will be received by the Secretary of the Municipal Board until 11 a. m., September 15, 1906, and thereupon opened, for the purchase of a lease of a hotel site in the north wing of the Luneta Extension, City of Manila.

The site is approximately 500 by 600 feet, fronting on the new boulevard on the east, with the Luneta on the south, Manila Bay on the west, and the new commercial center and works of the port on the north.

Detailed information and blank forms of proposal may be obtained at the office of the Secretary of the Municipal Board, Manila, P. I., or from the Chief of the Bureau of Insular Affairs, Washington, D. C.

Each bid will be accompanied by a certified check for ₱15,000 ($7,500, United States currency) as a guarantee that the bidder, if awarded the lease, will, after due notification, promptly enter into contract and furnish an acceptable bond in the sum of ₱20,000, ($10,000, United States currency) for the faithful fulfilment of the conditions of said contract.

The right is reserved to reject any or all bids, or to waive any defects.—*John M. Tuther*, Secretary of the Municipal Board.

DEPARTMENT OF COMMERCE AND POLICE.—Bureau of Port Works, Manila, P. I., July 19, 1906. Sealed Proposals for the construction of Two Steel Wharf Sheds and Wharf Railways at Manila, P. I., will be received at this office until 11 o'clock a. m., October 15, 1906, and then publicly opened.

Information furnished on application to this office, where plans, etc., may be examined.

W. L. FISK,

Lieut-Colonel, Corps of Engineers, U. S. Army, Director of Port Works.

OFFICE OF THE BUREAU OF SUPPLY.—Manila, P. I., July 26th, 1906. Sealed proposals in triplicate will be received at this office up to 11 a. m., September 10th, 1906, when they will be opened in the presence of the attending bidders, for furnishing 90 Round Piles, and 4000 lined feet Pine Plank, Creosoted.

Proper forms and specifications may be had on application to this office.

E. C. SHIELDS,
Purchasing Agent.

PUBLIC WORKS IN MOROLAND

(Continued from page 98.)

C., the entire superstructure has been rebuilt, the piles being still serviceable. Material used: narig for all timbers and pagatpat for deck and rail. Total cost ₱359.22.

Bridges Over Canal:—Under an appropriation of ₱2,000 00 in Act 63, three bridges across the canal, namely: the one in front of the Provincial Building and those at calle Hernan Cortes and Villalobos have been rebuilt with concrete abutments and pagatpat superstructures, which are finished in the natural wood color and present a very neat appearance.

Streets of Zamboanga:—Under appropriations aggregating ₱2,500.00, made in Acts 36 and 85, there has been built a concrete curb around Plaza Carlos I, and a combined curb and gutter on both sides of calle Corcuera and one side of calle Villalobos to the canal. The total length of combined curb and gutter is thirteen hundred and seventy-one feet, and the total cost ₱3.236; the difference between this item and the amount of the formal appropriations being the cost of the cement, which has been paid for from an appropriation for "Emergencies, Streets and Roads, Vicinity of Zamboanga." The total length of simple curb and of combined curb and gutter is about the equivalent of seventeen hundred feet of curb and gutter whose cross section is about one hundred and sixty square inches. The cost per lineal foot is about ₱1.70, containing a volume of mortar equal to about one-twenty-fifth of a cubic yard. The system has been so arranged as to drain itself, but an elevation in the canal level by the Quartermaster and a merely temporary connection to the Spanish gutters on calle Voluntarios render the efficiency of these gutters as drains somewhat uncertain. Pilar itself has been graded and raised. It was formerly about the worst street in the town of Zamboanga.

San Jose Road:—This work in progress at the beginning of the fiscal year has been continued by day labor. A length of eight hundred feet east of the San Jose bridge was resurfaced and one large stone bridge repaired.

Tumaga, Tetuan, Mercedes and Talontalon Roads:—These roads are directly connected and for the sake of simplicity are here treated under one head. The Tumaga road, from its inner end at the military reservation to its intersection with the Tetuan road, where the latter begins at the causeway over the rice fields, was ditched, provided with new culverts and surfaced throughout with coral rock, the surfacing having an average thickness of a foot. The coral has made an exceedingly good, smooth road, but will require frequent repair. Cost about sixty centavos, Philippine currency, per foot, for a length of three thousand five hundred feet. Thirteen thousand and four lineal feet of the Tetuan and Mercedes roads, including one thousand six hundred feet of exceptionally heavy embankment at the Tubungan end of the Tetuan road, were rebuilt and resurfaced throughout. Total disbursements from the appropriations for Tetuan, Mercedes and Talontalon roads, up to February 28th, ₱7,415.59, which would represent an average cost of nearly 50 centavos per lineal foot. Upon this work the labor consisted almost exclusively of Moros, who gave great satisfaction by their industry and ability to work. The Moros do not have the

numerous holidays which render the Filipino so unsatisfactory, and are, moreover, stronger and much more eager to earn money. This road work, however, was all done with hand tools and native transportation.

Beach Road From Magay:—Due to the storm of October 30th and 31st, 1904, about one thousand six hundred feet of this road have needed repairs, and one small bridge has been made necessary. This work has been paid for out of the appropriation for "Emergency Repairs," Acts 63 and 85, and has been completed at a total cost of about ₱350.00, or twenty-two centavos per foot, including all structures.

Road Machinery:—The stone crusher and engine and road roller, ordered through Mr. C. E. Helvie, of Manila, arrived at Zamboanga early in February. During February, the stone crusher and engine were set up at the site selected on the beach near the provincial jail, and at the close of the month these were almost ready for operation.

New Provincial Building:—The old building having proven inadequate for the accommodation of all provincial offices, and it being further regarded as expedient to house the offices of the municipality, those of the chief of police and the post office in the provincial building, the Provincial Engineer was called upon for plans and estimates for a building suited to the purpose. The plans proposed a plain but substantial building in the shape of an "L," whose main wing would be on calle Madrid and whose other leg would be so placed as to leave the garden visible from the street. The estimated cost of the building upon the above plans was, including necessary repairs and alterations in the old building ₱36,000.00, which sum, upon approval of the plans by the Legislative Council, was appropriated. Detailed specifications were duly prepared and bids were called for by advertisement in two Manila papers. No bids were received and, upon resolution of the Council, the Provincial Engineer was directed to perform the work by day labor and the purchase of materials in the open market.

Schoolhouse at Manicahan:—Plans and estimates for this building were duly prepared and this office authorized to accept the lowest bid received, that of A. Greig for ₱2,887.00. At the close of February the work had not yet been started.

Purchase and Issue of Supplies:—This office purchases, receives, issues and ships all supplies used in the Moro Province. This entails an enormous amount of work which is complicated by the fact that all available markets are poor and unreliable, and transportation facilities uncertain and irregular, requisitions not sufficiently in detail and usually unnecessarily frequent.

Reports, plans and estimates for a number of works in addition to those mentioned have been prepared.

Great difficulty has been caused by lack of transportation, especially in the road work. Carabao carts carry usually a load of not over six hundred pounds, and are, moreover, very slow. The animals themselves have become scarce, so that the cost of the work is always high, and even then, at some seasons, it is impossible to procure them as the carabao are needed for plowing. Were supplies and other services more easily procurable, the efficiency of the office would be greatly enhanced. As it is, the Engineer himself spends nearly all his time searching for supplies or trying to expedite their delivery. Experience has proved that native labor requires American supervision. As a result, a detached piece of work requires for its proper and economical performance that one of the few really reliable American employees attached to the office shall be detailed to supervise the work. Neglect of other equally important work follows and progress is therefore retarded. Up to February 10th, the office had not the services of a single capable and experienced engineering assistant, since it was not until January 1st that the employment of such an assistant was authorized. The result of this was that the Provincial Engineer in place of being able to travel so as to ascertain the needs and conditions of outlying districts, was forced to remain practically all the time at Zamboanga.

Respectfully submitted,

CHARLES KELLER,
Captain, Corps of Engineers.

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ANNIVERSARY EDITION

THE DAILY BULLETIN

We have received the fourth anniversary number of the *Daily Bulletin* of Manila, which surpasses all its previous attempts. The wealth of information pertaining to the Islands, contained within its 66 pages, covers nearly every field of industry and commerce. The articles are from the pens of the highest authorities, and are of such a practical nature that the paper should be purchased by everybody for mailing to some friend in the States.

Hon. Cameron Forbes contributes an authoritative leading article on the Railways of the Islands, Mr. H. T. Edwards, the fiber expert, writes again on our great hemp industry, and the Director of Agriculture, Mr. Welborn, contributes an excellent article on sugar, and also on the future of the hemp industry, through the development of new machinery, now nearing completion. The maguey industry, another fiber plant peculiarly adapted for these Islands, is described by the Hon. Dean C. Worcester in his usual interesting manner. The government has brought over several hundred thousand plants from Hawaii, and also a new machine for cleaning the fiber, and we may expect some developments in this line shortly.

The various articles are copiously illustrated and the typographical work above the standard.

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OFFICIAL

Proposals for the construction of vessels: Q. M. Department, Office of Water Transportation, Manila, P. I., August 7, 1906. Sealed proposals for the construction of one Sea-Going Tug; one Stern Paddle Wheel Steamer; one Steam Launch and one Hull for a Steam Launch will be received here until 8:30 a. m. September 27, 1906, and then opened. Blank forms and general description of vessels will be furnished on application to representatives of the Consular Service of the United States at Hongkong, Shanghai, Singapore, Kobe, Yokohama, Nagasaki or the Officer in Charge of Water Transportation, Manila, P. I. Envelopes containing proposals should be endorsed "Proposals for Construction of Vessels" and addressed W. S. Scott, Capt., Q. M.

DIVISION OF TRANSPORTATION, Q. M. DEPARTMENT, OFFICE WATER TRANSPORTATION

MANILA, P. I., August 7, 1906

GENERAL INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION OF THREE (3) STEEL VESSELS AND ONE (1) STEEL HULL, FOR THE UNITED STATES ARMY IN THE PHILIPPINE ISLANDS

1. SEALED PROPOSALS, in triplicate, subject to the usual conditions and all conditions stated herein, will be received at this office until 8:30 a. m. September 27, 1906, and then opened in the presence of attending bidders, for the construction and delivery, to the Quartermaster's Department at Manila, P. I., complete and ready for service,
One Single Screw, sea going Tug,
One Single Screw, Steam Launch,
One Stern Paddle Wheel Steamer,
One Hull for a Steam Launch, Machinery to be supplied by the United States, but installed by the contractor,
of the general description as stated herein.

2. Blank forms, general description of vessels and all necessary information will be furnished on application to representatives of the Consular Service of the United States at Hongkong, Shanghai, Singapore, Kobe, Yokohama, and Nagasaki, or the Officer in Charge of Water Transportation, Manila, P. I.

3. Proposals should be made only on the blank forms to be obtained as stated in paragraph 2, and should be prepared in strict accordance with the requirements made known in the advertisement and these general instructions and the printed instructions on the blank forms.

4. Each proposal should be in triplicate, and must be accompanied by a certified check in the sum of Two Thousand Dollars ($2000.00) as a guarantee that if the proposal is accepted within sixty (60) days from the date of the opening of the proposals, the bidder will, within ten (10) days after being notified of such acceptance, enter into a contract and give bond, if required, with good and sufficient sureties; and that in case of failure of the bidder to enter into contract and give bond, if required, the guarantee shall be forfeited to the United States.

The number and amount of check, and the name of bank on which drawn should be stated in proposals.

These checks will be kept in a secure place and will be returned to bidders by the officer in charge when no longer required to protect the interests of the Government.

5. The place of residence of each bidder, with post-office address, country, and state, district, or territory should be given after his signature.

6. Bidders are requested to be present at the opening of proposals, either in person or by duly authorized attorney, or other representative.

7. The amount of the penalty of the bond, if required, to be furnished by the successful bidder, will be not less than ten per cent nor more than the full sum of the consideration of the contract.

8. In submitting proposals, bidders should state the sum for which they propose to furnish the materials and perform the work required by the drawings and specifications for each vessel bid upon.

9. Proposals giving an aggregate lump sum for the construction of more than one vessel, or for all the vessels called for, can not be entertained. Bidders who are unwilling to accept award of contract for less than all or less than a certain number or percentage of value of all the vessels called for must so state in their bids; but any bidder who so desires may submit an alternative bid, as follows: (1) stating price for each vessel without conditions, and (2) stating reduced price for each vessel on condition that he is awarded all or a certain amount of the work bid for. In all cases where bids are not qualified by such restrictive conditions the Government will exercise the right of awarding contracts for a single vessel, or for any number of vessels less than the whole number mentioned in the list, according to its best interests.

10. Bidders must state the time they will begin the work on either vessel, if contract is awarded to them for the construction of only one vessel, and also the time they will begin work on each vessel should they be given the contract for all four, or more than one of the vessels. They must also state the number of days required for the completion and delivery of either vessel, if the contract is given him for only one vessel, and also the number of days required for the completion and delivery of each vessel should the contract be given him for all four, or more than one of the vessels; and in case of failure to complete and deliver the vessels, or either vessel, in the time stated in the contract, the right will be reserved by the United States to deduct the sum stated below for the respective vessels, for each and every day required for the completion and delivery of the vessels, in excess of the number of days stated in the contract, from any money due or that may become due the contractor by the United States:

Sea Going Tug:—Not to exceed Fifty Dollars ($50.00) U. S. Cy., per day.

Steam Launch:—Not to exceed Twenty Dollars ($20.00) U. S. Cy., per day.

Stern Paddle Wheel Steamer:—Not to exceed Twenty Dollars ($20.00) U. S. Cy., per day.

Steel Hull for Steam Launch:—Not to exceed Twenty Dollars ($20.00) U. S. Cy., per day.

Delays caused by hostilities, blockades, fire, the act of God, public enemies or restraints of rulers or princes being always excepted.

Proposals for construction in which time for completion of the work and delivery of the vessels, or either vessel, is not stated can not be considered.

11. All work must be done in a thorough workmanship manner, and all material used must be of the very best, and shall be subject at all times to inspection by representatives of the United States. Nothing but the very best material and workmanship will be accepted.

12. The "General Description of Vessels" given herewith is only a general outline to give the bidder an idea of the vessels required. The bidder must prepare all necessary drawings and specifications, which must be complete in every particular, and attach same to at least one copy of his triplicate proposal, stating in his proposal that such drawings and specifications are attached to and made a part of the proposal.

13. The successful bidder for each vessel will be required to furnish to the Government, upon completion of the contract, five (5) complete sets of drawings and specifications of vessel built.

14. Each vessel must be delivered in Manila Bay and given a trial trip as may be required by the United States, at the expense of the contractor, and must be thoroughly inspected by representatives of the United States, and found satisfactory to such representatives before being accepted.

15. The Government shall be at no expense in the construction or delivery of the vessels, or until the vessels are accepted, and then only the contract price.

16. As early as practicable after acceptance of each vessel, payment will be made to the contractor, at the price stated in the contract.

17. The successful bidder will be required to enter into contract with the Chief Quatermaster, Philippines Division, U. S. A., and the contract shall be subject to approval by the Commanding General, Philippines Division.

18. The United States reserves the right to reject any or all bids, or to accept any part of a bid that may be advantageous to the Government.

19. A copy of the advertisement, of the General Instructions, and of all drawings and specifications, must be attached to at least one of the triplicate proposals.

20. Proposals should be inclosed in sealed envelope, indorsed "Proposals for Vessels, to be opened at 8:30 A. M. September 27, 1906," and addressed to the undersigned.

W. S. SCOTT,

Captain & Quartermaster, U. S. Army,

In Charge Water Transportation.

GENERAL DESCRIPTION OF VESSELS TO BE CONSTRUCTED

ONE SINGLE SCREW SEA-GOING TUG

To be a sea-going tug, hull to be constructed of steel throughout, of the following dimensions and general specifications:

Length 140 feet.
Breadth 26 feet.
Mean draft 13 feet.

To be schooner rigged, and fitted with triple expansion surface condensing engines, and two main boilers Scotch Marine type, to develope not less than 1500 I. H. on actual steaming trial; steaming radius 2500 knots, without recoaling.

To be fitted with steam steering gear, steam capstan patent towing bitts, electric lights and search lights, fire pump and steam windlass.

Hold forward to be fitted with store-rooms and native crew's quarters.

Hold aft to be fitted for cargo and towing hawsers.

Commencing at forward end of house on main deck, arrangement to be as follows: Dining saloon, thwartship galley and pantry, one single bunk and one double bunk state-room on port side and two double bunk state-rooms on starboard side, boiler house and engine house.

A water closet to be in after port corner and a shower bath to be in after starboard corner of engine-room house.

A small lamp room opening aft to be between water closet and bath.

An eight inch wrecking pump to be supplied with all necessary suctions, discharges, etc.

Steam steering gear to be in upper engine-room and a small evaporator to be supplied and fitted.

Bridge, wheel house and Master's room to be built over Saloon pantry and state-rooms.

Heavy rope fenders to be made and fitted to bow and stern.

All connections between wheel house and engine room to be of latest pattern and design.

Boat to be supplied and fitted with all necessary running appliances and tools.

Boat to be supplied with one 90 fathom 6" and one 90 fathom 5" steel hawser and one 60 fathom 18" Manila rope hawser.

Bidders must state the maximum speed they will guarantee on six hours test.

A complete set of drawings and specifications of machinery and hull must accompany each bid.

Trial and delivery to be made in Manila at builders' expense.

ONE SINGLE-SCREW STEAM LAUNCH.

To be a single screw steam launch, constructed of steel throughout, of the following dimensions and general specifications.

Length over all 90 feet.
Breadth, extreme, 15 feet.
Depth moulded 7 feet 6 inches.
To be built of steel.
Deck 2"×4" teak wood.
Water tight bulkheads forward and aft.

Engine-room skylights and boiler house to be built of steel.

Awnings and side curtains fore and aft.

Engines to be compound surface condensing Marine type with line, air, circulating, feed and bilge pumps.

One donkey pump to have suction end connected to bilges, sea and water tank, discharge end connected to boiler and overboard.

One hand deck pump.

One injector connected to boiler.

One hand capstan forward.

Boiler to be Scotch cylindrical return tube type built according to Board of Trade rules for a working pressure of 150 lbs. per square inch.

Cabin to be fitted up forward with water closet, wash stand and necessary fittings and lockers, with hatch to deck.

Hatch to be fitted with a hinged wooden grating and hatch cover.

Grating to be fitted with a device for holding it open.

Deck over cabin to be fitted with two ventilators made so that they will screw into deck.

Two glass dead-lights and two brass gratings to be made to screw into deck when ventilators are not in use.

Tubing in engine and boiler room to be copper.

Engines to develope not less than 110 I. H. on an actual steam test.

One 4'×4' hatch fitted to deck aft.

Heavy towing bitts (wood) and towing rope guide to be fitted aft.

Engine-room and five-room skylights to be confined to as small a space as practicable to secure large deck space.

All connections between steering wheel and engine-room to be of the latest pattern and design.

Launch to be delivered with all running gear and tools complete.

Bidders will also state guaranteed speed per hour on a three hours' steaming test.

A complete set of drawings and specifications of hull and machinery must accompany each bid.

Delivery and trial to be made at Manila, P. I., at contractor's expense.

ONE STERN PADDLE WHEEL STEAMER

To be a stern paddle wheel steamer, to be constructed of steel throughout, of the following dimensions and general specifications:

Length of hull about 110 feet.
Beam 21½ feet.
Draft, light, 18 inches.
Bunker capacity to be about 20 tons.
Spoon bill bow.

Lower or main deck to be clear of all housing except two water closets, one kitchen, two lockers for stores, lockers for native crew and engine and fire rooms.

Steel Bullworks on main deck to be not over three feet high.

Upper deck to be fitted with light railing and awnings and side curtains.

Awning frame to be made collapseable.

Stack to be hinged to upper deck.

Wheel house and two cabins to be on upper deck built of steel.

All connections between wheel house and engine-room to be of latest pattern and design.

Each cabin to be supplied and fitted with two combination bunks and settees, lockers and wash stands.

Water tanks to be in hold.

Main and upper decks to be of steel.

One hand capstan forward.

Steamer when completed, to develope a minimum speed of twelve knots per hour on a three hour speed trial.

Upper deck forward and aft to be strengthened to carry two machine guns and shields.

Weight of gun and shield about 500 pounds.

Two fore and aft bottom strakes to be reinforced with double plating.

Bidders must submit with their proposals a full set of drawings and specifications of machinery and hull of proposed steamer.

Bids will also be considered for delivery of steamer in Manila in sections or in plates and frames set up in Manila by contractors.

Trial test and delivery of steamer to be made at Manila, P. I., at contractor's expense.

ONE STEEL HULL FOR A STEAM LAUNCH

To be a steel hull for one single screw launch complete and ready for the installation of boilers and engines.

Length over all 84 feet.
Length B. P. 80 feet.
Breadth moulded 14.5 feet.
Depth moulded 6 feet.
Deck 2"×4" teak wood.

Two water tight bulkheads, one forward and one aft.

Engine and fireroom houses to be of steel.

Cabin with wash stand, water closet, settees and lockers to be forward.

Entrance to cabin from deck to cabin to be through hatch.

Wooden hinged grating to be fitted to hatch with device for holding same open.

Hatch cover to be made and fitted for cabin hatch.

Two ventilators to be made and fitted to deck over cabin.

Ventilators to be made so as to screw into a brass deck ring.

A brass grating and a dead light to be made to screw into deck plate when ventilators are not in use.

One 4'×4' hatch to be made in deck aft.

Wooden towing bitts to be fitted and towing rope guide fitted to stern.

Engine and fireroom houses to be confined to as small a space as possible so as to give large deck space.

The latest improved connections to be installed between wheel and engine room.

All tubing in engine and firerooms are to be of copper.

All fittings, mountings, valves and cocks on boiler are to be new.

All cocks and valves on engine are to be new of brass.

All tubing, piping and connections are to be new.

Launch will be supplied and fitted with one deck hand pump.

One new injector will be supplied for boiler.

One new donkey pump will be supplied (Worthington duplex) and fitted in place, suction end to connect to hot well, tanks bilge and sea.

Discharge end to be connected to boiler and overboard and condenser.

Stern tube to be new.

Tail shaft and propeller to be new.

Thrust bearing will be new.

The thrust bearing and stern tube as shown on blue print will not be furnished by this department but must be furnished and installed by builders.

One hand capstan forward, furnished and installed.

Engines, condenser and boiler will be turned over to the builders by this department without any mountings, cocks, valves or tubing.

Before installing the boiler it is necessary to make the following repairs to same.

Renew about 30 rivets in upper side of inside furnace end.

Renew about ten tubes.

Calk seams and make new grate bars, bridge wall plates and bearing bars.

Bidders must submit with their proposals a full set of drawings and specifications of proposed hull.

Bids with the following conditions will also be considered:

Boilers and engines to be placed at ship's side, Manila Bay, by this department and shipped at builder's expense and risk to their ship yards or plant and installed there.

Bidders must give speed guaranteed on a three hours' steaming trial.

Delivery and trial to be made at Manila, P. I., for installation of machinery and boiler, as shown in the attached drawings and such machinery and boiler must be installed at the expense of the contractor.

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SYLVESTER FARRELL, SECRETARY ACTING SECRETARY

OFFICE ADMINISTRATION BLDG ROOMS 33 TO 35
EXPOSITION GROUNDS

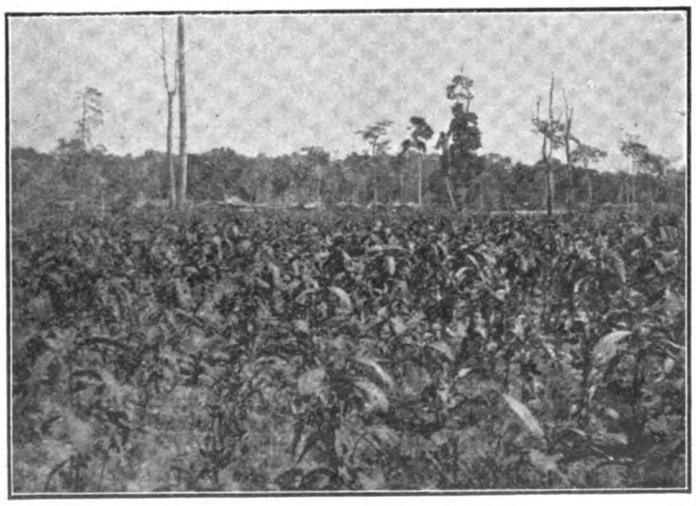
PORTLAND, OREGON. October 18, 1905.

Messrs. Baer Senior & Co's Successors,
Prop. "La Yebana" Cigar Factory,
Manila, P. I.

Gentlemen:-

In answer to your letter of recent date, I have the honor to inform you that the two gold medals awarded the "La Yebana" Cigar Factory for the best manufactured cigars, and the best quality of cigars were given your factory after a careful and complete examination by the International Jury of Awards of this Exposition, and that your cigars were judged together with all other cigar exhibits on the grounds, including Havana and Domestic cigars.

Yours truly,
[signature]
Director of Exhibits and Member
of International Jury of Awards
Lewis & Clark Exposition.



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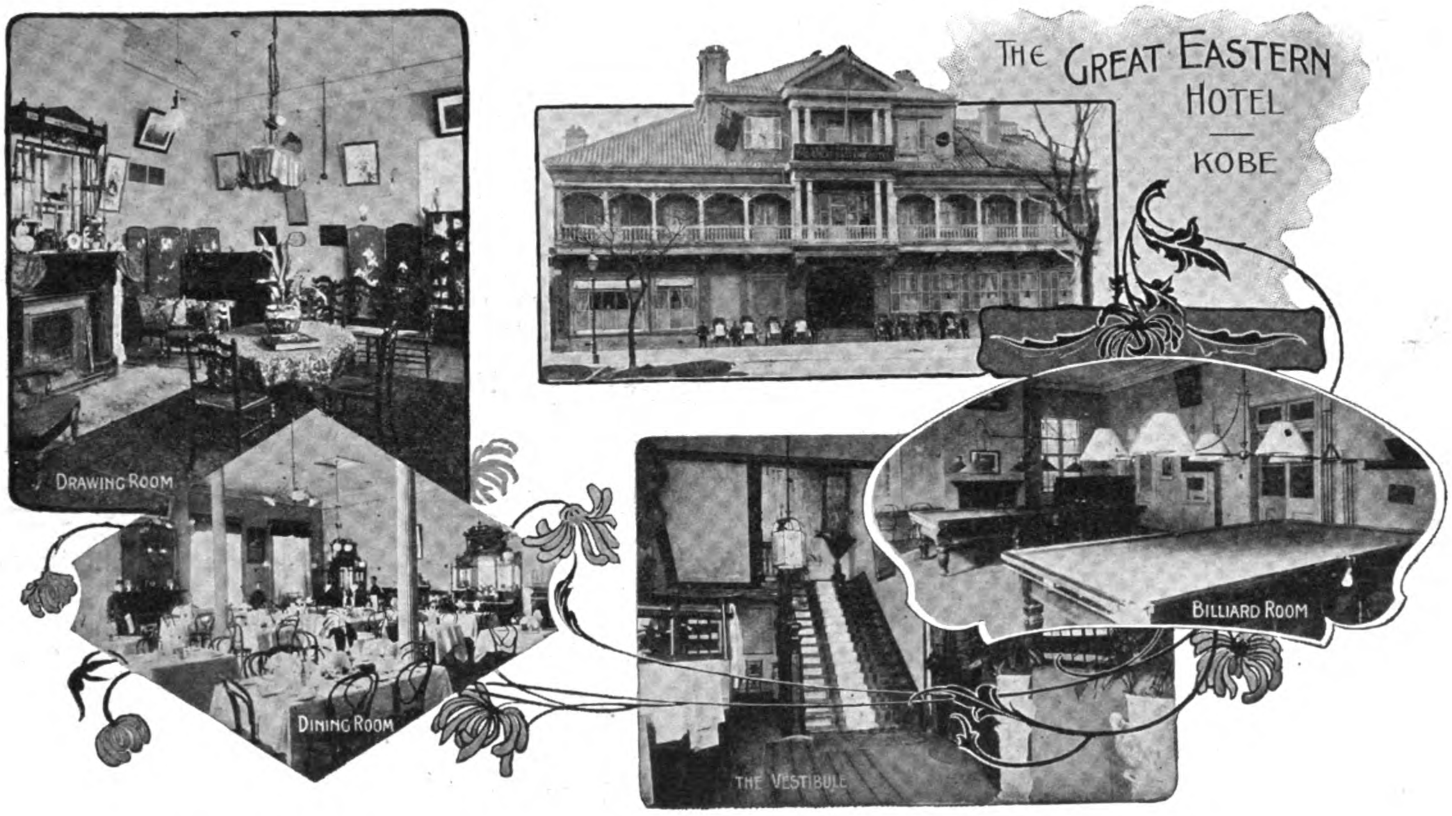

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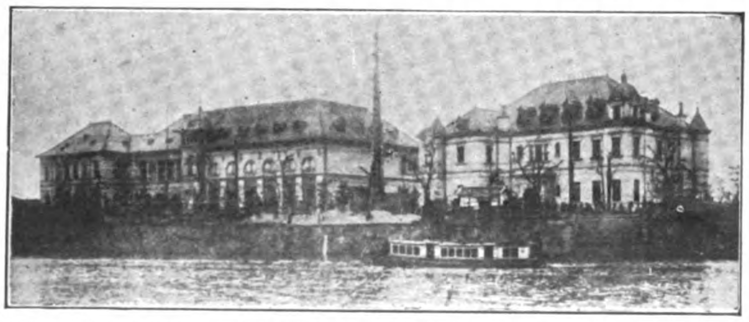

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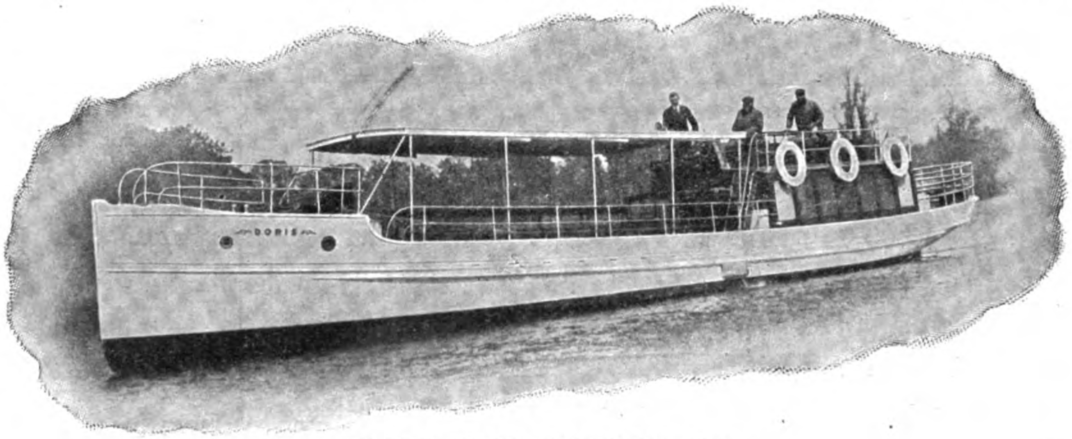

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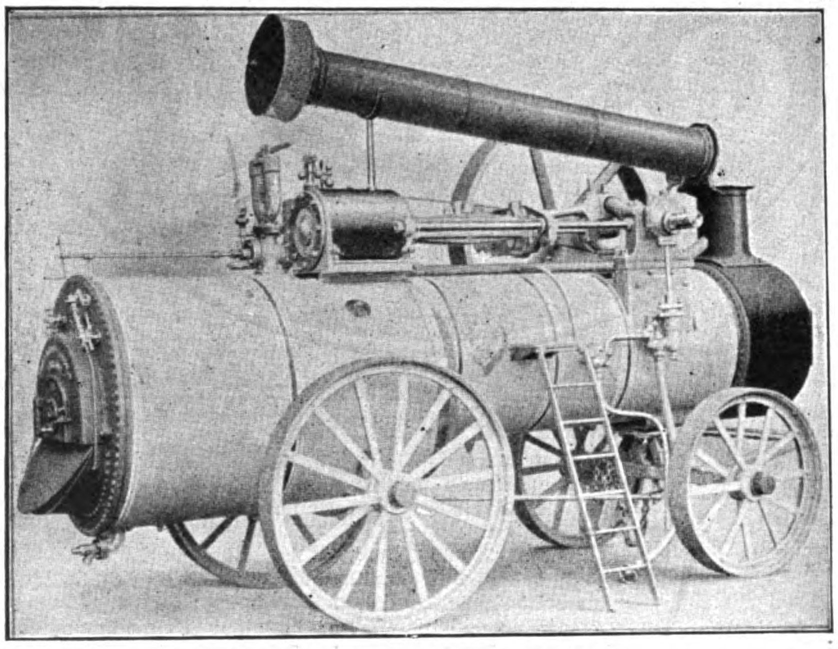

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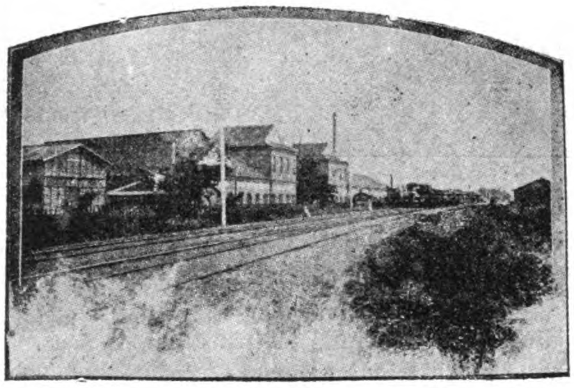

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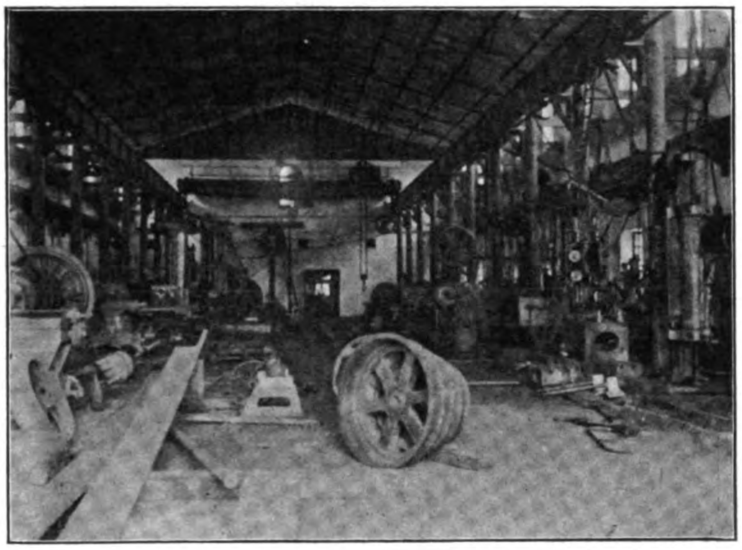

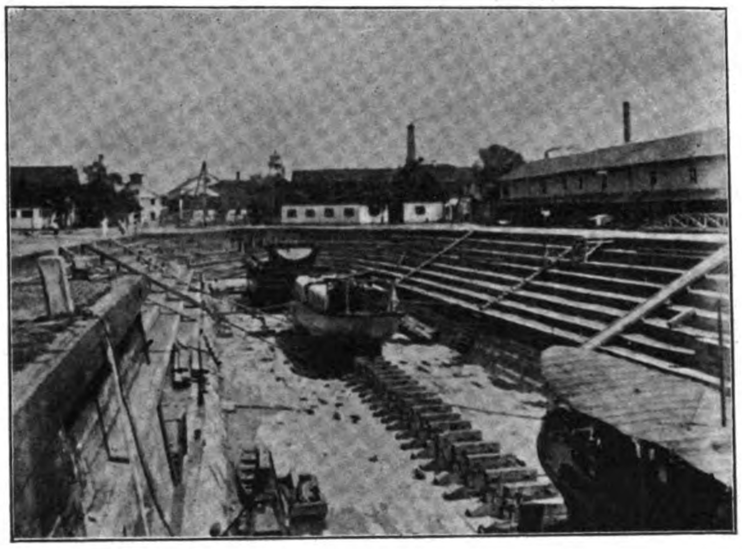

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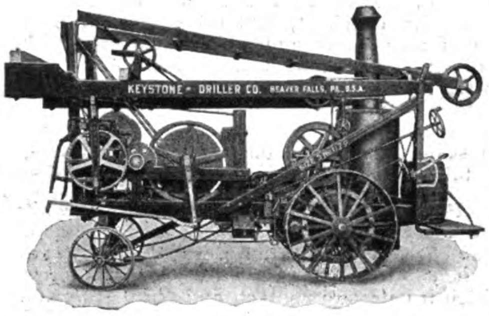

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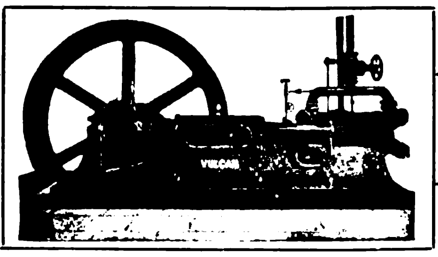
VUL  CAN

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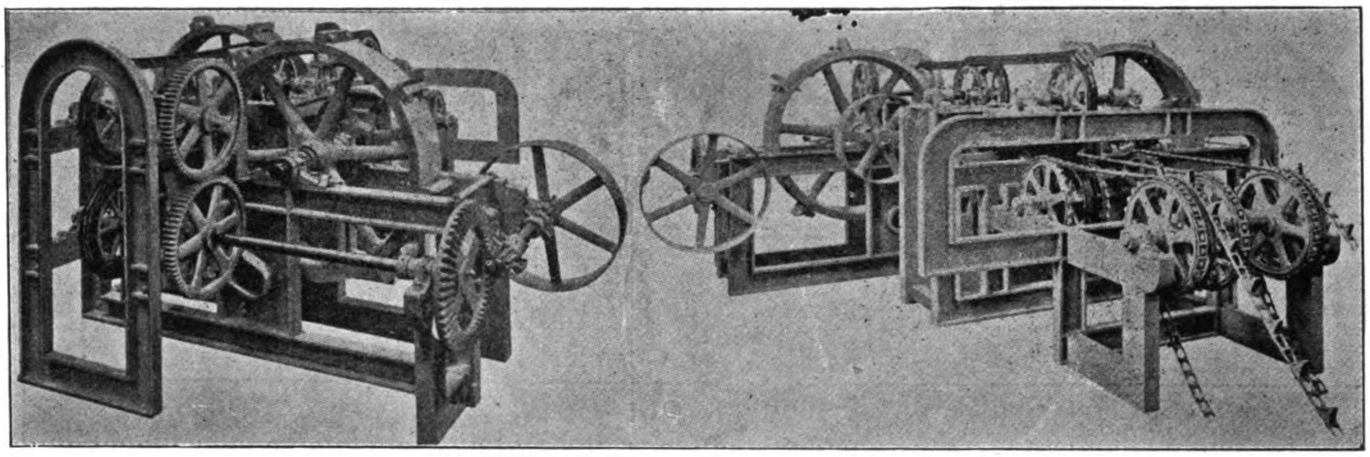

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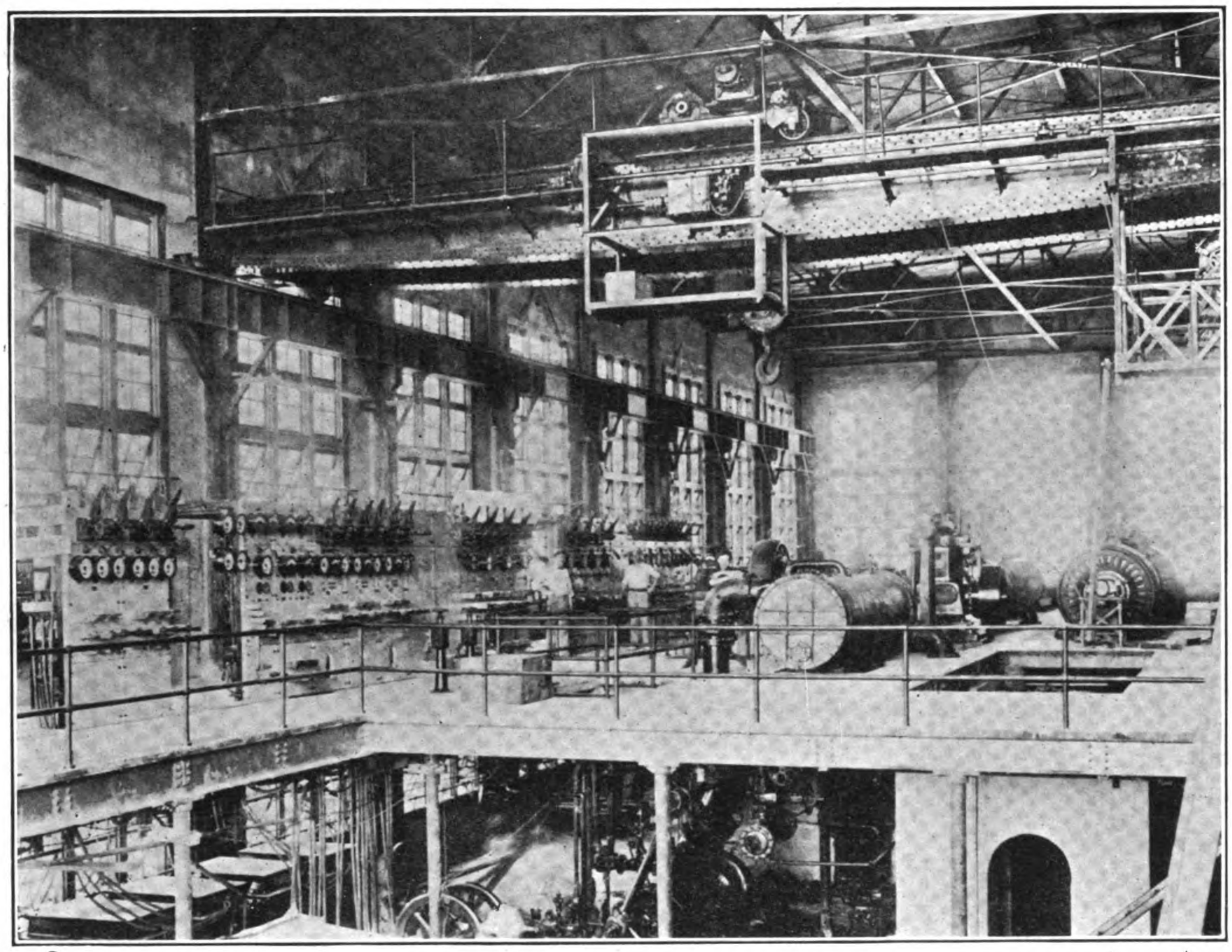

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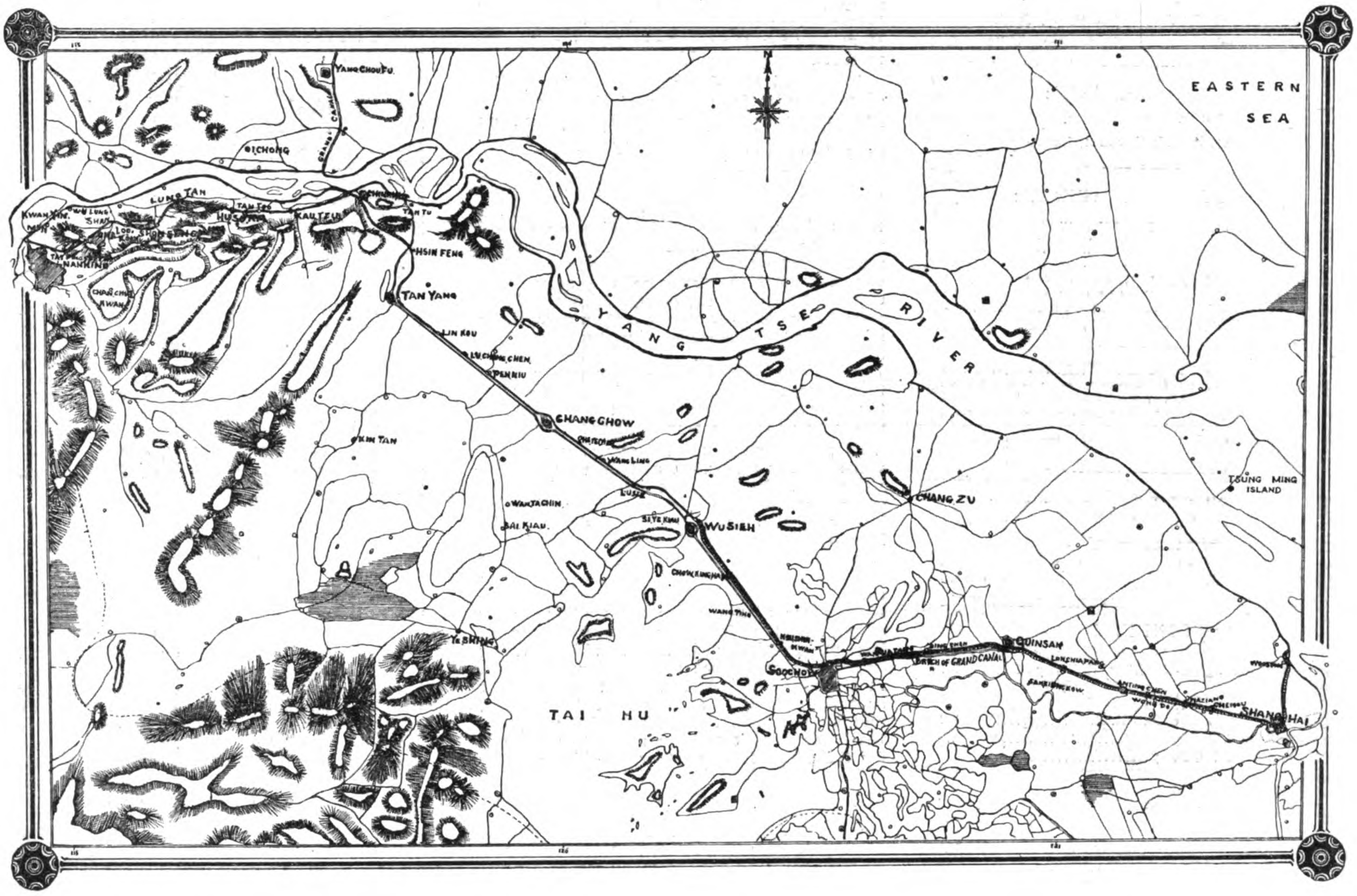
COMMERCE ✇ ENGINEERING ✇ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, SEPTEMBER, 1906. No. 4.

SHANGHAI-SOOCHOW-WUSIEH SECTION OF THE SHANGHAI-NANKING RAILWAY SYSTEM



MAP OF THE SHANGHAI-NANKING RAILWAY

The second section of the Shanghai-Nanking Railway, comprising about 80 miles, is now in operation, and two passenger trains and several freights are running daily between Shanghai and Wusieh, which are the terminal points of this division. This railway is being constructed by the British and Chinese Corporation under concessionary grants from the Peking Government. The joint agency of the corporation is controlled by the well-known firm of Messrs. Jardine, Matheson & Co. and the Hongkong and Shanghai Banking Corporation, the former looking after affairs in connection with the construction and operation of the system, and the latter the financiering of the project.

An idea of the importance of this Railway may be gleaned from an extract from the address of Taotai Shen Tung Ho, of Shanghai, delivered at the ceremonies which attended the formal opening of this new section, which occurred in July. He reminded his hearers that the Province of Kiangsu, in which both Shanghai and Nanking are situated, has an area of 44,500 sq. ms. with a population of more than 38,000,000 people; so that, while the province is smaller than England in area, it possesses one-third more population. And as the line passes through the most fertile portion of the province its expectations may faintly be realized.

ENGINEERING FEATURES.—The road construction between Shanghai and Wusieh produced no particular engineering difficulties; it rather called for painstaking care. The surface is almost entirely of alluvial deposit with an underlying strata of silt, and the

(Continued on page 114)

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MANILA, SHANGHAI AND YOKOHAMA, SEPTEMBER 1906

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SUGAR REFINING IN THE FAR EAST.

The "Hongkong Telegraph" in its issue of August 7th, ulto., reviews the condition of the sugar refining industry in Hongkong, and after recognizing the inevitable competition from Japan, ventures the opinion that, given a fair field and no favors, the local companies can hold their own against any competitor. This is undoubtedly true as regards the Eastern markets outside of Japan. In this country everything points to an early monopolization of the refined sugar business by the Japanese refineries. The trade returns indicate that Japan will continue to increase her imports of raw sugars, and correspondingly diminish the imports of refined grades until her local consumption is fully covered. How far this consumption is capable of extension depends on the education of the Japanese to a preference for the refined article, and the ability of the refiners to keep the price within the purchasing power of the poorer classes. With this big home demand to supply and cater to, under natural conditions, it would be a long time before Japan will figure as a competitor with Hongkong for the supply of China and other markets.

Japan and Hongkong receive their supplies of raw sugars from the producing centers of Java and the Philippines, and are placed on equal footing in this respect. The difference in freights and labor favors Hongkong in determining the cost of refining and their ability to control the market. With the conventional tariff on refined sugars in Japan of about six tenths of a cent per pound, it gives a practical monopoly of the home market to the Japanese refiners, and even with a rebate on exports they can not hope to overcome the advantages enjoyed by Hongkong, on supplying the China market, unless they receive certain concessions in freights from subsidized lines that will make it possible to compete. If the present policy of Japan is any indication of what may happen in the future, this lowering of freights in favor of the Japanese product will be the determining factor on which the trade will swing.

In 1900, Japan imported raw sugars to the value of Yen 11,007,634 and in 1905 to Yen 13,046,772. In 1900 the imports of refined sugars amounted to Yen, 15,598,894 of which Yen 9,448,860 came from Hongkong, while in 1905 the imports of refined had dwindled to Yen 659,415 of which only Yen 178,516 was supplied from Hongkong. These figures from the Japanese official reports, show that in the short space of five years the trade formerly enjoyed by the Hongkong refiners with Japan has been practically wiped out, and is a striking object lesson of what the world must expect in other lines of industry. Up to the present sugar does not figure in the exports from Japan, and by the time their refiners have covered the home market and are ready to reach out for the China field, another formidable factor will have appeared in the field. The passage of the Philippine Tariff Bill will eventually lead to the establishment of one or two large refineries in the Islands, or to the erection of large modern central factories where it will be comparatively easy to manufacture a sugar white enough for the Eastern Market with little or no extra cost.

Japan has a supply of about 50,000 tons from Formosa, and is making an effort to develop this industry by government subsidies. In the last four years, including the estimates for the present year, the Government will have expended Yen 644,000 in the encouragement of the sugar industry in Formosa. This field will, however, never assume any great importance as a producing center, except under the stimulus of heavy government bounties or a high protective tariff, as the sugar content of the cane is not high enough to make the venture profitable. The Japanese evidently recognize this, and their avowed intention of creating a beet sugar industry in Manchuria, indicates that they are keenly alive to the facts of the situation, and are determined to hold their own in the coming struggle for the control of the Eastern markets.

THE YUNNAN RAILWAY

"Many articles and communications from correspondents about the progress of work on the Yunnan Railway and the treatment of the Chinese laborers employed by the contractors, have appeared in the press of the Far East during the last month.

"The country traversed by the road is in a part of the world rarely visited by travellers, and reliabe information and data is difficult to secure. The *least* authentic information came from Mr. Little, who made the trip down to the coast from Yunnan, but his narrative is more of a descriptive nature than interesting to engineers."

The above appeared in our last issue, and owing to an error of proof reading an unintentional slight was given to Mr. Archibald Little's interesting description of this remote part of the world. The word "*least*" should read *latest*, placing quite a different meaning to the sentence.

A PHILIPPINE PENAL COLONY.

In this issue will be found an interesting article on the new penal colony on the Island of Palawan. As stated in a previous editorial on this subject, the question of providing suitable employment for the native convicts has been given considerable thought and study on the part of the Secretary of Commerce and Police, Hon. Cameron Forbes. Following the excellent example set by other countries in the East, the plan of establishing a large penal colony on an undeveloped island has been selected as the best solution to the present vexatious problem, and work has been progressing for some time.

The scheme, as worked out, must prove successful, and eliminate one great cause of friction between the government and local merchants.

In sending down a new man to manage the colony, one free from the influence of the present prison officials, the government has made a wise move, and one which should convince the community that it intends to push the scheme through. It will be some time before the permanent barracks are planned and built, and the congestion relieved at Bilibid, and the manufacturing enterprises of this institution confined to their proper scope.

OUR PROBLEM

The inauguration of Governor General Jas. F. Smith opens up another chapter in the history of our occupation in these Islands, the conclusion of which will determine largely the success or failure of our mission here. We are familiar with the policy of the Government which hopes that ultimate success will be attained through the education of the present generation, and we have consistently taken the opposite view that, unless we develop the Islands and give the masses work and increase their material wants and prosperity, all other efforts will be wasted and result in disaster.

The new administration of affairs in the Islands will have to confront this commercial problem, and be judged according to its ability to bring prosperity out of bankruptcy and disaster.

There are many who hold divergent ideas as to the means by which the desired end can be reached, but we stand to our conviction that free trade with the United States is the only solution to the present financial depression, and until this concession is secured from Congress, all effort of the new insular administration to ameliorate our situation will be handicapped.

THE FAR EASTERN REVIEW has consistently labored to secure the passage of the bill embodying the granting of free trade with the Islands, and has carried on a campaign of education amongst the merchants and manufacturers of the United States in regard to our great possibilities.

For over two years, some 1500 copies of each issue of THE FAR EASTERN REVIEW have been circulated amongst the merchants,

manufacturers and financial institutions of the United States, which has resulted in attracting attention to the Philippines and other countries of the Far East. But yet, we feel as though all our labor is lost unless we can further educate American capitalists, and bring about a feeling which will force the Senate to grant us the one boon which will place us once for all on the road to prosperity.

With this end in view, we have gradually extended our sphere of influence in the East, to make our paper more valuable, and now we propose to open a permanent office in New York, where we can get into closer contact with our manufacturers and contribute our share in the campaign for developing the Islands. Our proprietor, Mr. Rea, expects to sail for the United States in the near future, to personally take charge of the new office, and lend his efforts to promoting the Islands in the financial center of the country, and cooperating with the Government and commercial bodies in bringing about a change of feeling concerning the Islands.

HEMP MACHINERY COMPETITION

Under the old Spanish régime, that government kept a standing reward of $100,000 for the person who would successfully invent and operate a hemp-stripping machine. The importance of such an apparatus for the economical treatment of our principal staple was thus early recognized, and as the demand for hemp became greater, the scarcity of labor compelled the employment of some mechanical means to offset this disadvantage. The crying need of the Islands is the invention of some machine which will develop our great natural resource, and so cheapen the product that it will obviate the use of the many inferior fibers, the demand for which is encouraged because of the backward state of the great industry nature has centered in these Islands. The prize to the successful inventor is a great one, as it means the rapid accumulation of a large fortune, and a place in the ranks of the world's great benefactors.

The inventive instinct of Americans has been brought into action to solve this problem, and from time to time since our occupation various individuals have perfected plans and patents of machines for this purpose. Several of these have already been built, and private experiments conducted at great expense to insure a perfect machine before offering it to the public.

Mr. Lindsay, Castle Bros-Wolf & Sons, M. A. Clarke, Mr. Solignac, Mr. Wheeler, Captain Leonard and other prominent commercial and professional men are at present interested in new hemp stripping machines, and now the Director of Agriculture has entered the field with a commercial machine, which was recently tested at the Government Experiment Station in Manila.

The race for public favor is a keen one, and the successful machine will soon command a large sale and great profits. In view of this condition the race should be clean cut, open, fair and equitable for all contestants, without the suggestion of official favor to any one machine. The natural impulse of trusting inventors is to seek such aid, information and sympathy as may be at the command of the Government through the natural channels of the Bureau of Agriculture, and their first endeavor, after the completion of such a machine, is to secure an official indorsement of its merits. Such an approval would be worth thousands of dollars to any firm in opening up the market and interesting the natives in buying the machines. Several such machines were officially tested by the Agricultural Bureau last year, and according to the report of the Bureau of Agriculture were failures.

Of course it is urged that the Government is absolutely impartial in these tests of machines and every inventor will be given a square deal, but human nature is so constructed that it will take a powerful lot of explanation to make the ordinary inventor believe that he will receive favorable consideration from a Bureau whose Director is interested in the sale of another type, or that the official machinery manufacturer will not use his position to further his own ends to the detriment of other less favored competitors.

There seems to be considerable grounds for this attitude on the part of the man in the street, for we find that the Director of Agriculture has already gone out of way to publicly criticise those types of machines not built according to his ideas and his patent, but which other men are struggling in the open field to have recognized, without the powerful prestige of the Government to uphold and push them towards success.

The last Report of the Bureau of Agriculture, under the head of hemp machinery, has the following statement: "By means of correspondence, and through the columns of the 'Scientific American' this subject has been brought to the attention of American inventors and manufacturers, with several of whom we are now in communication. To our local inventors we have offered every possible encouragement and assistance in the way of suggestion, raw material and facilities for testing machines."—"During the past half year two different machines have been officially tested by this bureau. The model of a third machine has been submitted for our inspection and the machine itself will be ready for use in a few weeks."

During all this time when the Bureau was in correspondence with American manufacturers and inventors, and giving suggestions to local inventors, inspecting models and passing on their merits officially, the head of the Bureau was quietly perfecting the plans for his own machine. And yet the Government cannot imagine why the business community doubts its sincerity and the purity of its officials. It might be urged with some justice that a Government official has a perfect right to exercise his inventive genius, or adapt an old principle to his machine, so long as the desired end was accomplished, but when, in his official capacity, he is receiving through his bureau the confidences of other inventors who look to him for that aid to which they are entitled, the ethics of the proceedings are not all that might be desired, and opposed to the best ideas of Government. When we add to this feature the fact that the official still retains his position where he can influence the sale of his machines to the detriment of others, there is just cause for complaint. We have other good men in Manila who hold to views quite the opposite to those advanced by the official and who are quietly spending money to perfect their ideas without any chance of publicity except through paid advertisements in the public press, but with the competition of the official inventor, it is being urged in official reports and signed newspaper articles that his idea alone is right and the others wrong. In his report as Director of Agriculture for last year, Mr. Wellborn goes out of his way to decry the light machines and indorse the type of machine he was then having patented, and again in the Anniversary Number of the *Daily Bulletin*, in an article over his signature he again points out the demerits of competing machines and calls attention to the superior qualities of the type he was soon to place on the market.

Mr. Solignac, a prominent lawyer of this town, has been working for some months to get his machine before the public, and there are others who feel that they can not expect a square deal in competition with an official who has the prestige of his position to push the sale of his patent, and now that his machine is actually on the ground and has been given an official test, it would only be fair to all parties concerned if the Director of Agriculture should meet the opposition on equal grounds.

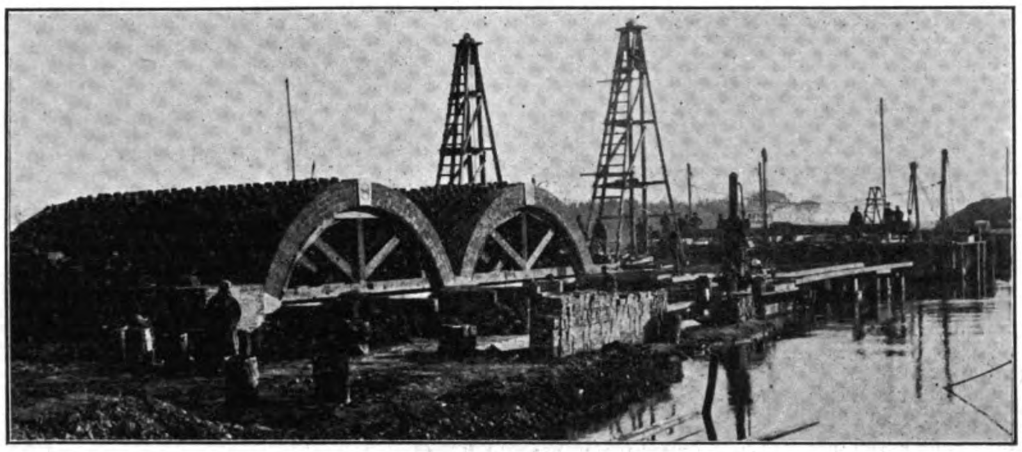
Without entering into a discussion of the ethical points involved, common fairness demands that Mr. Wellborn should resign his high position, and enter the commercial field on the same basis as the vendor of any other machinery, and leave the merits of his invention to be officially passed on by some one not financially interested. Otherwise the situation will remain unpleasant, and the government open to continual criticism. We believe no public official can legitimately hold office and at the same time be in a position to advance his private interests. The very semblance of such a state of affairs is sufficient to cause a scandal. The mere suggestion in Washington that some officials were interested in certain lands along the lines of the projected railways, was sufficient to call for an explanation which averted what threatened to result in a Senate investigation, and any similar raking of Philippine muck should be stopped at once.

MR. ELSER'S RETIREMENT

During the absence of the publisher of THE FAR EASTERN REVIEW in the United States, covering a period of about eight months, Mr. E. E. Elser, Assistant Manager of the well-known firm E. C. McCullough & Co., Inc., kindly performed the duties of Business Manager of this publication. Recently the business department of THE REVIEW was reorganized, Mr. Elser retiring. THE REVIEW wishes to publicly acknowledge the splendid service Mr. Elser rendered during his incumbency.

THE SHANGHAI-NANKING RAILWAY

Railway construction after modern engineering practice is splendidly exemplified in the work being done on this important line, which, when completed, will open up one of the finest agriculture districts in North China. While the line is being constructed under the nominal provisions of a British-Chinese concession, it is notable that the British interests have had almost exclusive control of the project both in the matter of financing and construction. The second section of the road, from Shanghai to Wu Sieh, was recently opened for traffic, and splendid trains are now being run regularly between these two points with a prospect of the operation of the entire line through to Nanking within another year. While these details are slightly aside from the engineering features of the project they lead up to the splendid work of construction which characterizes not only that part of the road now in operation, but that under way. Messrs. Jardine, Matheson & Co. have had exclusive control of this part of the work and have furnished all the materials. Under the able direction of Mr. Collison, the engineer-in-chief, the construction is all that could be desired. While up to the present time there have been few difficult engineering features to overcome, yet, when the fact is taken into consideration that railway construction in China is difficult under the simplest conditions, the manner in which the work is being carried on is noteworthy. The road work is equal in stability to any to be found in other parts of the world where such construction is within easy reach of the base of supplies, and the culvert and bridge work is second to none. The latter construction is exclusively reinforced concrete where that material can be used. The station houses are of substantial brick construction, and altogether the line has the appearance of permanency and stability. The cement used in this construction is the famous "Tongshan" brand manufactured by the Chinese Engineering and Mining Company, and has given eminent satisfaction. Altogether, the Chinese are to be congratulated upon the splendid railway that British engineering and financial enterprise is accomplishing for them in the Shanghai and Nanking line.



SHANGHAI-NANKING RAILWAY: BRIDGE ARCHES NORTH OF SOOCHOW

SHANGHAI-SOOCHOW-WUSIEH SECTION OF THE SHANGHAI-NANKING RAILWAY SYSTEM

(Continued from page 111)

route is through a country that is rich in agriculture and as level as a billiard table, figuratively speaking. The surface had to be carefully prepared for the roadbed, and finally a 2′ layer of ballast superimposed. The ballast is principally broken Soochow granite with a strain of limestone throughout, and the road has been built with all the care and solidity of a grand trunk line, and can not but furnish a most useful object-lesson to the Chinese for the lines they seem eager to construct for themselves in other parts of the empire. Aside from embankment, bridge and culvert construction on a small scale the laying of the tracks was uniformly uninterrupted, but it is understood that the engineering features of the construction from Wusieh to Nanking, *via* Chinkiang, are quite difficult, there being several heavy grades to overcome besides the boring of a tunnel something over 1500 yds. at Chinkiang which is giving the engineers considerable trouble on account of the frequent caving of the earth. The Shanghai-Wusieh section of the line was commenced about 15 mos. ago, and the whole railway is expected to be completed by the spring of 1908. Beyond Wusieh much of the construction is in an advanced stage and ground has been broken at intervals all the way up to Nanking, 193 ms. from Shanghai.

The line consists of long stretches almost perfectly straight. There are few gradients. The country is interspersed with numerous creeks and water courses, of which, between Shanghai and Soochow alone, there are 160.—Owing to the unstable soil foundations cofferdams had to be resorted to in a number of instances. One viaduct over Quinsan Creek is 400′ on brick piers and steel girders, with arch approaches.

A considerable difficulty is being dealt with in connection with the construction in the shape of the graves, which, to the number of many thousands, dot the entire route from one end of the line to the other. Each individual family has to be dealt with, a fresh burial site purchased or allotted, and the necessary rites and ceremonials carefully attended to in connection with the transfer of corpses. As may be imagined, this calls for no small display of tact and that it has thus far been achieved without a single instance of a riot is sufficient proof of the careful diplomacy of the officials to all who know the Chinese and his violent passions and superstitions towards their dead.

The line is at present but a single track through to Wusieh, although it is intended that it shall be doubled-tracked from Shanghai to Soochow in order to provide for the line from Soochow to Ningpo and Hangchow, for which the British and Chinese Corporation has a concession. With this in view the route for double tracks has already been laid out, all the bridges and culverts have been constructed to the full width, and everything is ready for the ballasting of the road and the laying of the rails. All arch bridges and culverts and the foundations of the few girder bridges throughout the entire system are being constructed of reinforced concrete.

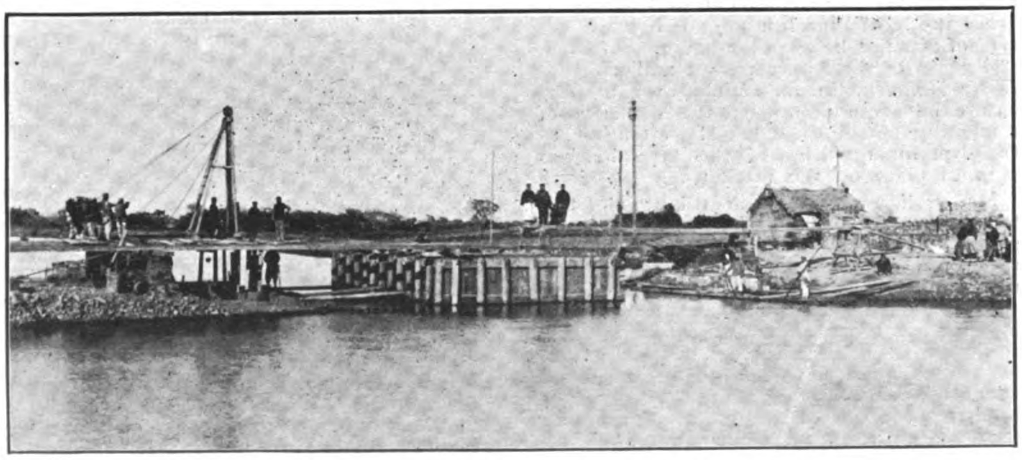
CONSTRUCTED UNDER BRITISH CONTROL.—The railway is being entirely constructed under British control, and the materials, equipment and machinery are also British or colonial. The ties are of Jarrah hardwood, a splendid structural timber furnished by Messrs. Jardine, Matheson & Co. from Australia. The steel rails are 80 lbs. and 36′ in length, and are being supplied by Messrs. Guest, Keen & Nettleford and by Cammell, Daird & Co.

ROLLING STOCK.—The passenger locomotives are the 4-wheel-coupled type, and were built by Robert Stevenson & Co. of Darlington. The boilers contain 214 tubes of 2″ diameter, with a working pressure of 180 lbs. to the sq. in. The cylinders are 18″ with 26″ stroke. The diameter of the coupled wheels on tread is 6′7″, the front of the engine is carried on 4-wheel bogeys and have a diameter of 3′ 6″. The tender capacity is 3,500 galls. of water and 7 tons of coal, and in working order the locomotives just scale 105 tons. The freight locomotives are of practically the same capacities, but with six coupled wheels 4′ 9″ on the tread.

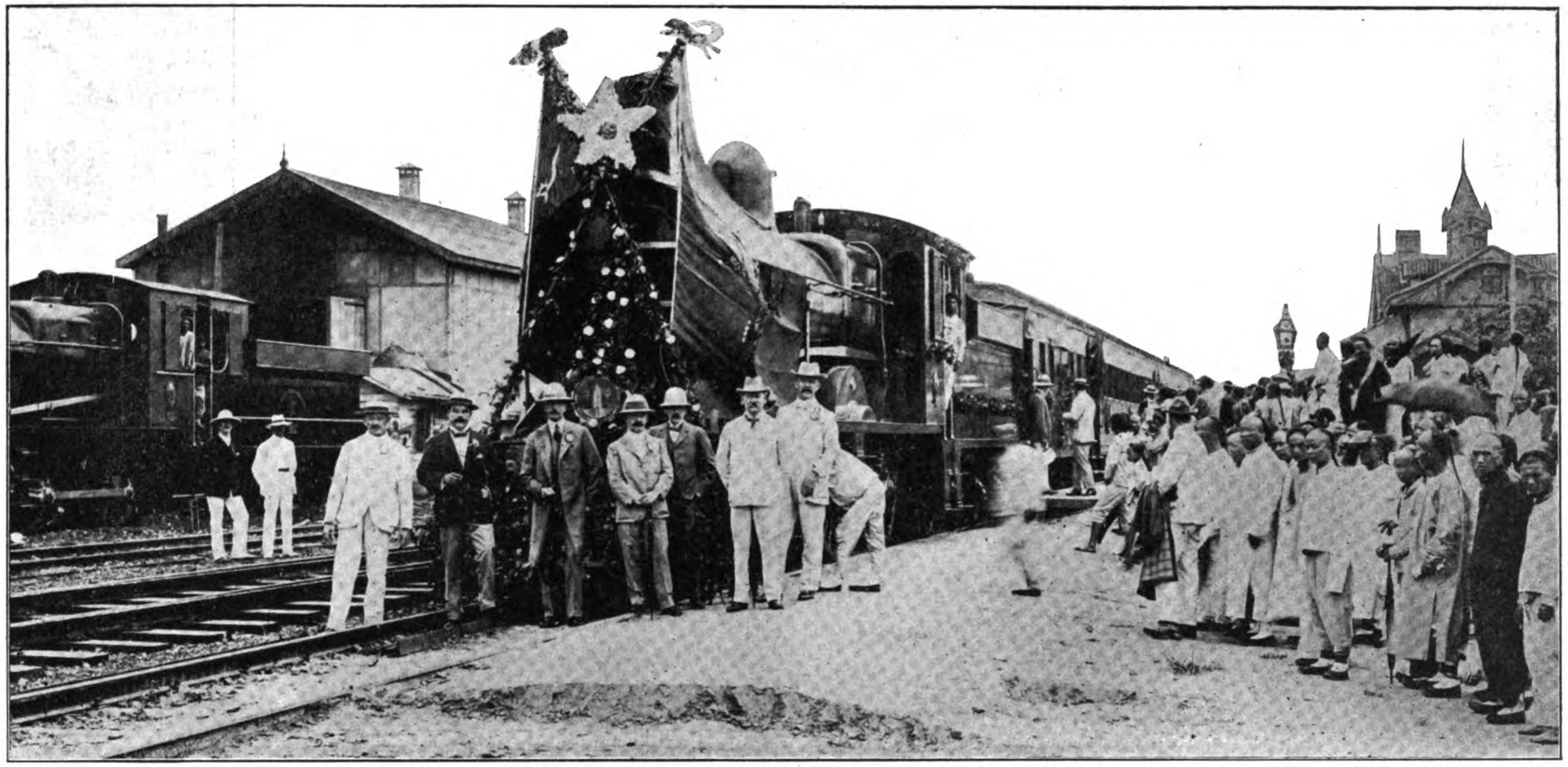
PASSENGER CARS.—The three classes of passenger cars are of the central-aisle type and accommodate 72 passengers in the 1st-class, 90 in the 2d-class, and 100 in the 3d-class. The coaches are divided by partitions, but are not composite. They are warmed with steam heat in the winter, but no extra provision is made for cooling in the summer beyond the ventilators in the roofs. The 1st-class coaches are comfortably upholstered and have a limited quantity of interior decoration. The new saloon coaches were expected to arrive in time for the inauguration of the Shanghai-Wusieh section, but the construction gangs got ahead of the home department. When they arrive they will be accompanied by handsome dining saloon cars 65′ long, together with kitchen cars, so that every convenience for refreshments for travelers will be provided. Sleeping cars will hardly be necessary, as Shanghai and Nanking will only be about 7 hrs. apart when trains are run through between these two points.

FARES ARE MODERATE.—The fares are extremely moderate—3d-class, 1 cent gold per mile; 2d-class, 1½ cent, and 1st-class, 3 cents. Even this low rate for the 3d-class may meet with a development, for it may occur to the officials that a 4th-class in the small hours of the morning, composed of freight cars, might be run to enable the small farmers to bring their daily produce to market. No doubt such an innovation would be well received and extensively patronized. The land being broken up into tiny holdings, the little farmer may be seen daily with his two huge baskets on the ends of his *bo*, on his way

SHANGHAI-NANKING RAILWAY: BRIDGE ARCHES UNDER CONSTRUCTION, SOUTH OF SOOCHOW

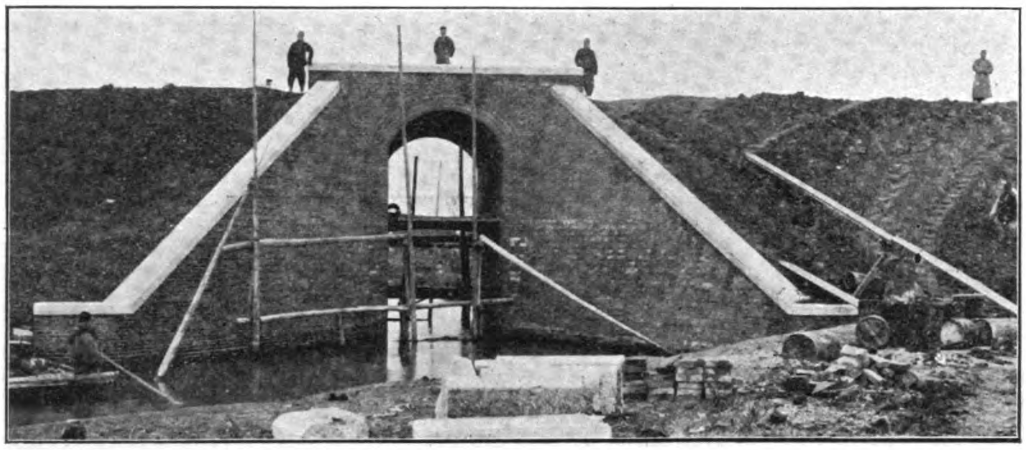


SHANGHAI-NANKING RAILWAY: CONSTRUCTING A COFFERDAM



OPENING OF THE SHANGHAI-NANKING RAILWAY

Locomotive "C 13" ready to start on the inaugural trip over the line from Shanghai. The gentlemen in front starting from the left are:—Mr. E. J. Dunstan, Locomotive Superintendent; Mr. A. H. Collinson, M. I. C. E., Engineer-in-Chief; Mr. Henry Keswick, of the British and Chinese Corporation, and Jardine, Matheson & Co.; Mr. J. D. Smart, of the Hongkong and Shanghai Banking Corporation; Mr. J. O. P. Bland, Secretary of the Shanghai Municipal Council; Sir Pelham L. Warren, K. C. M. G., British Consul General at Shanghai; and Mr. James McKie, of Messrs. Jardine, Matheson & Co.



SHANGHAI-NANKING RAILWAY: BRIDGE OVER A CREEK NEAR SOOCHOW

o the nearest market. This antiquated method of transportation is only feasible within a certain limited distance and probably the course suggested would meet with its reward in more ways than one.

FREIGHT CARS.—The freight cars are good, serviceable-looking constructions of the latest types. Those on steel 4-wheel bogeys have a capacity of 35 English tons. There are some smaller open 4-wheel cars carrying 18 tons, and a fine type of steel-covered car, also run on bogeys, with a carrying capacity of 30 tons.

The engineers and firemen are at present Europeans on all passenger trains, although natives are being trained and will supersede when they become practically efficient.

LABOR.—The laborers employed on the construction are entirely native, under British supervision. They have been drawn from all parts of the empire, and three and a small fraction may be taken as the equivalent of an English section hand. With wages, therefore, ranging from 15 cents gold for ordinary, and 25 cents for foremen and gangers, some idea of the comparative cost may be imagined. There have been no strikes thus far, and but few disputes. When it is remembered that two Chinese from 50 ms. apart can not speak the same dialect it says a good word for all parties concerned.

STATIONS.—The stations are on an average 6 ms. apart. They are built on one side of the line in the English fashion. The platforms are ballast-edged with stone coping, and are coach high. The offices and residences for the staff, who are all Chinese at the wayside stations, are handsome red and white brick structures of solid and comfortable appearance. It speaks well for the presumably peaceful intentions of the surrounding populace, and forms a considerable contrast to the stations on the Chinese Eastern Railway, each one with its fortified tower and wall. The platforms are long enough for any estimated traffic.

Shanghai station is awkwardly situated at a considerable distance from the center of the settlement. This is probably due to certain local causes at the conception of the enterprise, when the idea of any railway at all was far from being popular. It was also the terminus of the little line from Woosung, which was not a British concession. A more direct road than at present exists is in prospect, and possibly a branch of the electric railway will ultimately connect with it. The station has, however, ample sidings, engine houses, and sheds for cars. About ½ m. up the line an extensive locomotive roundhouse is in course of construction and at Markham-rd, about 1 m. out, the future freight depot is located. It has enormous sidings and stores, together with a magnificent wharf on Soochow Creek. This has been of the greatest use during the construction as by means of the creek the company's own lighters have been enabled to transport all sorts of machinery and materials to convenient spots, thus facilitating the construction simultaneously at various localities. Its immediate access to the river and sea will make this depot an ideal one. Probably, although there is no passenger station at present, the corporation will find it advisable to establish one at this point as it is less than a mile from the fashionable residential portion of Shanghai, and a road from it will tap the electric street railway line.

ENGINEERING STAFF.—The railway is being constructed under the supervision of the following engineering executive staff—A. H. Collinson, M. I. C. E., engineer-in-chief; A. C. Clear, Assoc. M. I. C. E., Soochow Division; F. Grove, M. I. C. E., Wusieh Division; J. G. Barkley, M. I. C. E, Chinkiang Division; M. R. Sinclair, M. I. C. E., Shanghai Division. Mr. Collinson is well known in connection with the Great Northern and London-Brighton systems of England and the Buenos Ayres Great Southern Railway in South America, and he was also employed for 10 yrs. on the construction of the Great Central Railway to London, from Annesley to Rugby.

JAPANESE CEMENT TRADE

Japanese cement, as an article for export, has not yet reached the status of the principal staple articles, its export being only half-a-million yen or thereabouts a year, but the "Chugai Shogyo" thinks there is no doubt, however, that the trade is on the eve of expansion, as the demand for Japanese cement will increase with the development of Korea, Manchuria, Russian territory and other Eastern countries. Nine years ago its export only amounted to 16,000 yen in value, but in 1903 it had increased to 590,000 yen. The war has put a temporary check to the growth of the industry, but with the restoration of peace a revival has taken place. Not only is the demand for Japanese cement springing up in Korea and Manchuria, but large orders received for San Francisco brought about since the earthquake and conflagration have given a great impetus to the cement industry in this country. All the stock in the market has been cleared and the cement companies are now busily engaged in manufacturing to meet requirements. The amount of cement exported during the last ten years is as follows:—

	Quantity. kin.	Value. Yen.
1896	2 322,644	25.372
1897	938,188	16,257
1898	2,108,686	36,955
1899	4,648,722	62,632
1900	15,088,419	194,469
1901	17,815.512	245,081
1902	22,840,563	308.349
1903	41,749.234	596,204
1904	39.085.471	548,497
1905	31,614 437	395,392

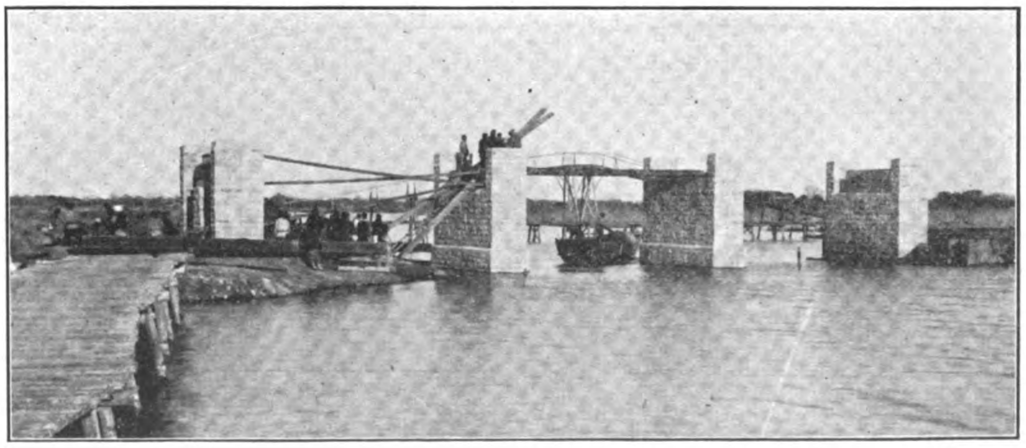
Up to the end of May this year the value of cement exported had reached over 423,000 yen, while the figures for the corresponding period of the two preceding years were 198,000 yen and 217,000 yen respectively. That is to say, the quantity exported during the first five months of this year exceeded that for the whole of last year. The principal countries to which cement was exported during the whole of 1905 and the first four months of this year are as under:—

	1905. kin.	1906. kin.
Korea	13,455.653	4,823.382
America	298,140	7.428,338
China	4 790,812	2,291,925
Manchuria	—	1,731,859
Dutch India	3,326	487,500
Russia	500	302,405
Philippines	4,133,287	300,080
Hongkong	988,440	90,000
Straits	60,000	56,000
Australia	28,728	28,728
Canada	7,755,771	—
Others	99,780	66,173

The remarkable increase in export to America that has taken place this year is doubtless owing to the unlooked-for event at San Francisco, while as to the gradual increase of export to Manchuria, Korea, and Asiatic Russia there seems to be little doubt. Next it will be interesting to review the amount of capital invested by the various cement companies and their annual producing capacity.

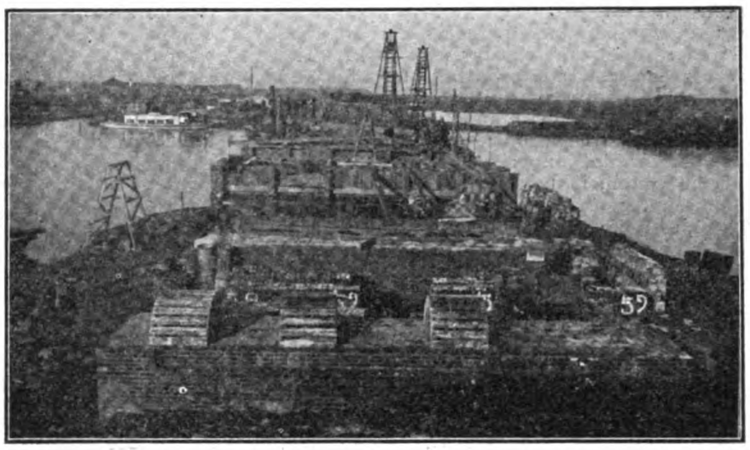
	Capital invested. Yen.	Producing capacity. Barrels.
Onoda	959,000	200,000
Osaka	333,000	90,000
Kyushu	280,000	30,000
Mikawa	110,100	40,000
Hokkaido	500,000	90,000
Nippon	510,000	90,000
Saga	341,000	50,000
Chuo	421,000	120,000
Aichi	403.000	120,000
Miye	168,000	30,000
Asano	800,000	200,000
Suzuki	110,000	40,000

Of these it is only the Aichi cement which made a dividend of over 10 per cent for



SHANGHAI-NANKING RAILWAY: BRIDGING THE GRAND CANAL

BRIDGING A CREEK NEAR WUSIEH



QUINSAN VIADUCT

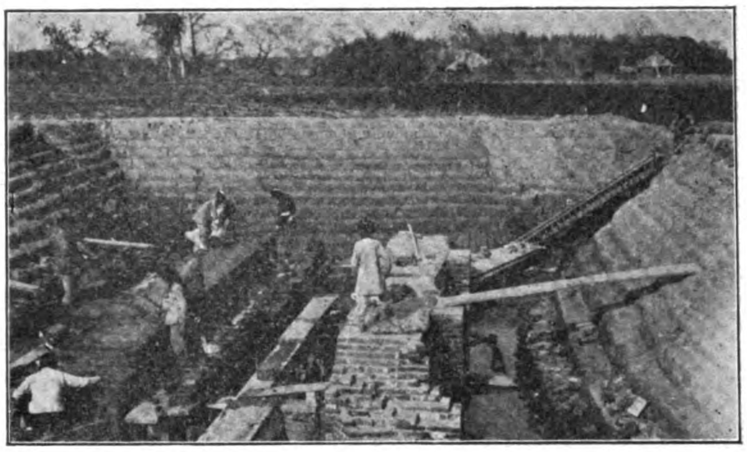
last year, while the majority had to content themselves with dividends of 5 per cent or less. In short, all the Japanese cement companies have hitherto been suffering under a disadvantage, but now a new stage of development seems to have opened up for the trade.

MACHINERY FOR MALAYA

Writing to the *African World* Mr. Ralph Stokes of Tanjong Malin, Perak, says:—

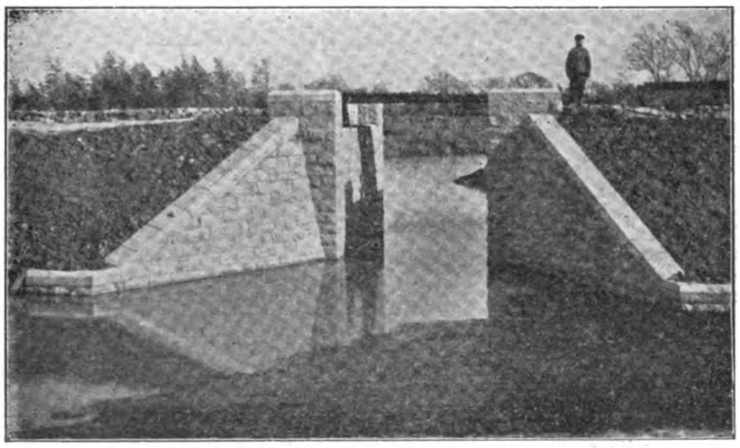
Manufacturers of mining machinery would do well to take note of the growing requirements of the tin-mining industry of the Federated Malay States, which promises to rapidly develop into a valuable new field of business. In the past the producers of it—for the most part Chinamen—have employed large numbers of coolies, and utilized the simplest sluicing plant in their work, the pump and its engine often being the only items of mechanical equipment on their properties. Being also "towkays" or merchants, there has been method in this seeming madness, but, as in all mining fields robbed of their surface riches, the saving of the industry today depends on low-grade propositions, worked on a large basis and with labor-saving devices. At the present time several important schemes formulated on this principle are under weigh; if successful there will be a boom in highly mechanical systems, and even the conservative Chinaman will be prompted to negotiate with the makers of machinery rather than the recruiters of labor. At one property, named Tanjong Rambutan, a 16 in. suction dredge, constructed by the Austral-Otis Company, of Melbourne, is being installed to deal with a large body of low grade ore. At Redhills one may see a Blondin conveyor, steam navvy, stamps, and new type of concentrating plant in course of erection. At Tronoh a new power installation is contemplated. At the Kampar property of the Société des Etains de Kinta a turbine to utilize a large fall of water will be at work early next year, generating up to 500 h. p.; and in many other sections of the country, Perak especially, engineering progress is manifest.

Mine labor is almost entirely Chinese; a fair percentage of Tamils are employed. The indolent Malay prefers fishing or grooming of horses. The cost of living has been greatly increased by the fixing of the dollar at 2s. 4d, and unskilled labor is not cheap, according to the Eastern Standard. The standard wage is 50 cents, or 1s. 2d., per day, with rice and accommodation. But the quality of the Chinese labor is exceptionally good. I have questioned many managers as to their views of this class of labor, and without a single exception they have told me that it is of the very best conceivable, and easy to handle. Those who have not been to South Africa refuse to acknowledge that the Kaffir can be a superior working factor. Those who do know the Rand—and several local engineers can be thus classified—affirm that the black assuredly is not a better workman. The China-

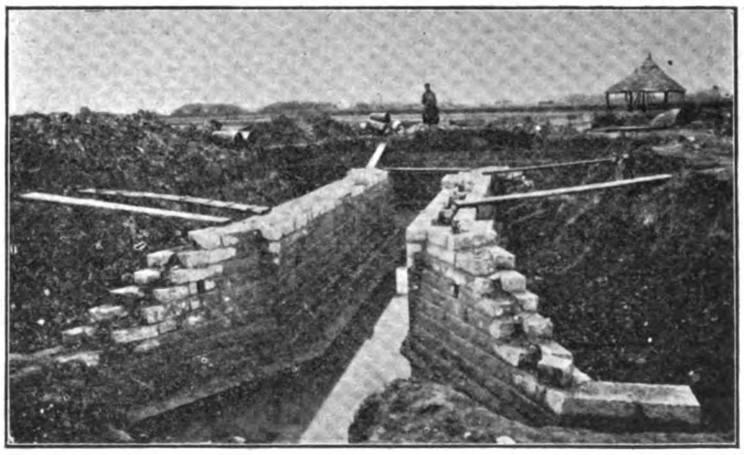


FOUNDATION FOR A CULVERT

CONSTRUCTION OF RAILWAY ACROSS A MARSH



TYPE OF CREEK BRIDGE



CULVERT UNDER CONSTRUCTION

man's chief defect (or virtue ?) is his extraordinary contempt for danger when engaged in underground or excavating work. The burying of a comrade by a fall of roof or slip of overburden appears quite a pleasant diversion in the day's monotonous round.

The coolies are put on contract work wherever practicable, experience having shown that the system is extremely economical.

Another fact that must hasten the general adoption of mechanical installations is that the Chinese immigration is now well-nigh at a standstill. The growth of prosperity in Southern China and the demands for labor set up by the new railways have resulted in diminishing the comparative attractions of foreign lands. These conditions are manifest to those concerned in Chinese affairs in Perak. So vast is China and so varied its populations, however, that generalisations concerning its labor supplies are clearly hard to advance, and the experience of this peninsula; although a Chinese colony, in all but administrative control, may prove deceptive as a formula for wider application.

PULAU LAUT

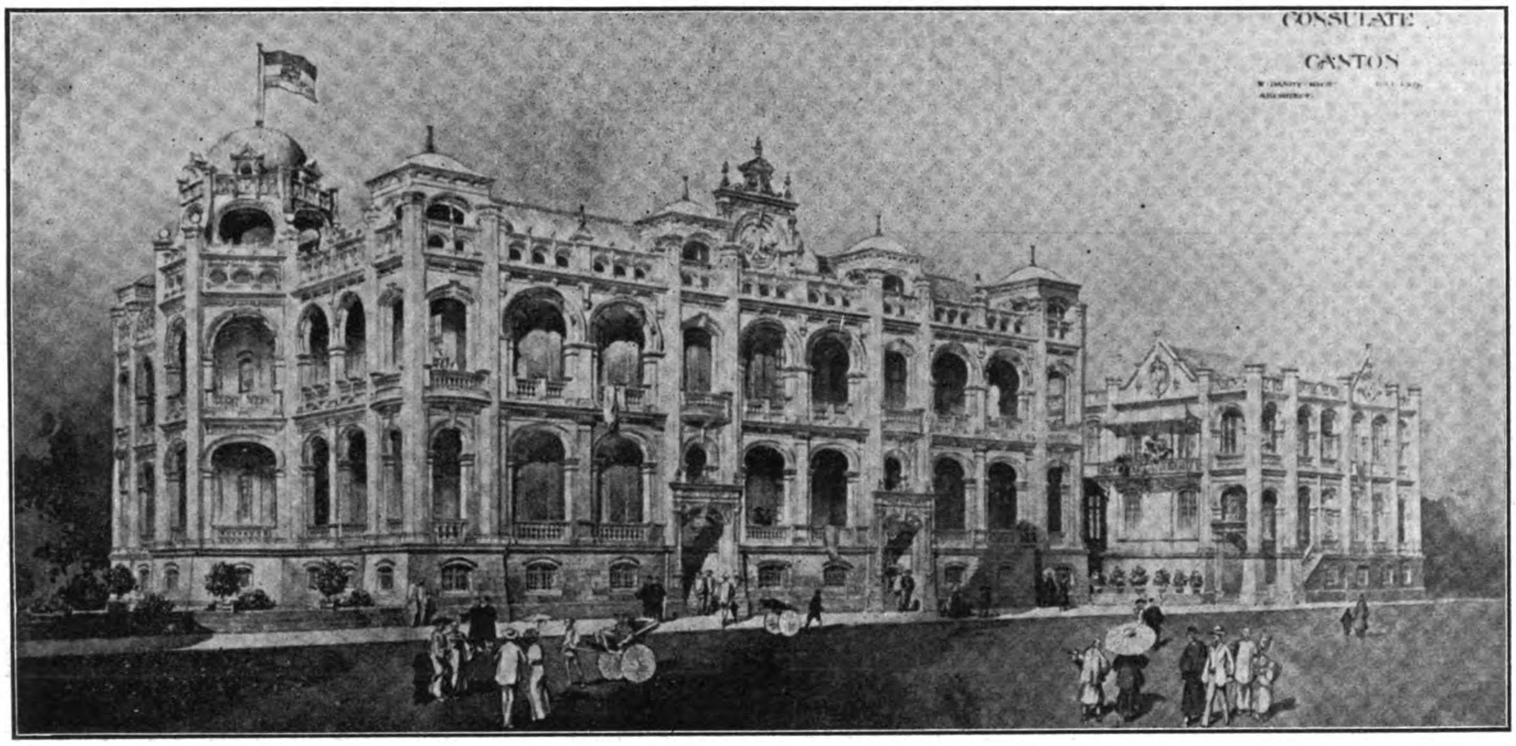
With regard to the rumours that Germany had obtained a coal station in the Netherlands-India possessions, viz., the island Laut, situated off the south-east of Borneo, it may be mentioned that some coal mines are worked there, which have produced of late large quantities. These mines belong to the Coal Company Pulau Laut, established in 1903 in this city (Amsterdam) the Director being Mr. P. Kolff, and Commissaries Mr. C. J. K. van Aalst, Mr. H. C. van der Honert, Mr. Aug. Jannsen, and Jonkheer H. Loudon. The capital of 5,000,000 guilders, as far as it has been issued, is nearly all taken up by the named gentlemen and the Netherlands Trading Company. In the early days of its existence the Company had to struggle with many difficulties, but since the coals fetch better prices, and the production increases, better times have arrived. The Company has constructed on the island a railway of 5 kilometres, by which the coals are carried from the mines to the vessels. There is such deep water that steamers with even the greatest draft can come into the harbor. The whole establishment is provided with electric light, while an electric loading engine is being constructed of great capacity. The coals can be produced cheaper at Pulau Laut than on the Ombilien coalfields because the mines are nearer to the sea. Lately the Company has concluded large coal contracts with foreign shipowners, of which the largest is the North German Lloyd. In consequence of this circumstance the German steamers regularly call at the named harbor, and this has given the impression that Germans had obtained a monopoly.

(London & China Express,)

IMPERIAL GERMAN CONSULATE, CANTON

The two fine blocks of buildings for the Imperial German Consulate which have recently reached completion on Shameen, says the *Canton Daily News*, are certainly the handsomest buildings here and an ornament to the bund. The front building which is the Consul's residence standing on the bund distinctly adds to the beauty of the settlement, being in accordance with the best traditions of its surroundings, and no expense and trouble have been spared to make the buildings beautiful and their occupants comfortable. The spacious verandahs around the whole building render the rooms delightfully cool. The chief entrance leads to the central hall, which is handsomely fixed and decorated. A dome, lighted with tinted glass, surmounting this central area leading in produces a very fine effect. All the entrance doors to the building are of stained glass displaying the German Eagle. A fine saloon 42 ft. long by 22 ft. wide occupies part of the front on the ground floor.

The offices of the Consul and his staff are situated at the rear on the ground floor, while a large spacious dining saloon is opposite the chief entrance. A teak wood staircase mounts from the Central Hall to the first floor, the decorations and balustrading from hall to dome being of carved teak wood. The first floor contains the private sitting, reception, sleeping and guest rooms of the Consul, all spacious, airy and tastefully decorated, and furnished. All the fittings in both buildings are of the best description, most of them having been imported from England. Messrs. Arnhold, Karberg and Co., who have supplied and fitted the electric installation, are to be congratulated on the taste and care with which their work has been carried out. The building situated on the central street of Shameen will be occupied by the interpreter Dr. Walter and Mrs. Walter, who dwell on the first floor, and the Chancellor Mr. Lohmann and Mrs. Lohmann who reside on the second floor. On the ground floor there are the office of the Interpreter and his Chinese staff and the Imperial German Post Office. The building has been carried out to the designs and under the supervision of Mr. W. Danby, M.I.C.E., whose large and varied experience out here has resulted in the production of a handsome addition to the residences on Shameen.



NEW IMPERIAL GERMAN CONSULATE AT CANTON. W. DANBY, M. I. C. E., ARCHITECT

GOVERNMENT PURCHASE OF JAPANESE RAILWAYS

At a special Cabinet Council held in the latter part of July, the Government decided to purchase the following six railways, and in the afternoon communicated the decision to the parties concerned.

The railway belonging to the Hokkaido Colliery and Railway Company and Kobu Railway to be purchased on October 1, this year.

The Nippon Railway and Gan-netsu Railway to be purchased on November 1, this year.

The Sanyo Railway and Nishinari Railway to be purchased on December 1, this year.

According to a table of valuation of railways, which was distributed among the members of the Houses in the last session of the Diet, the above railways are valued as follows:—

THE NIPPON RAILWAY

	Yen.
Capital	50,451,800
Cost of construction	54,479,359
Estimated price of purchase	130,532,540

THE SANYO RAILWAY

Capital	32,799,700
Cost of construction	36,787,664
Estimated price of purchase	74,042,980

THE KOBU RAILWAY

Capital	3,265,000
Cost of construction	3,318,219
Estimated price of purchase	9,729,020

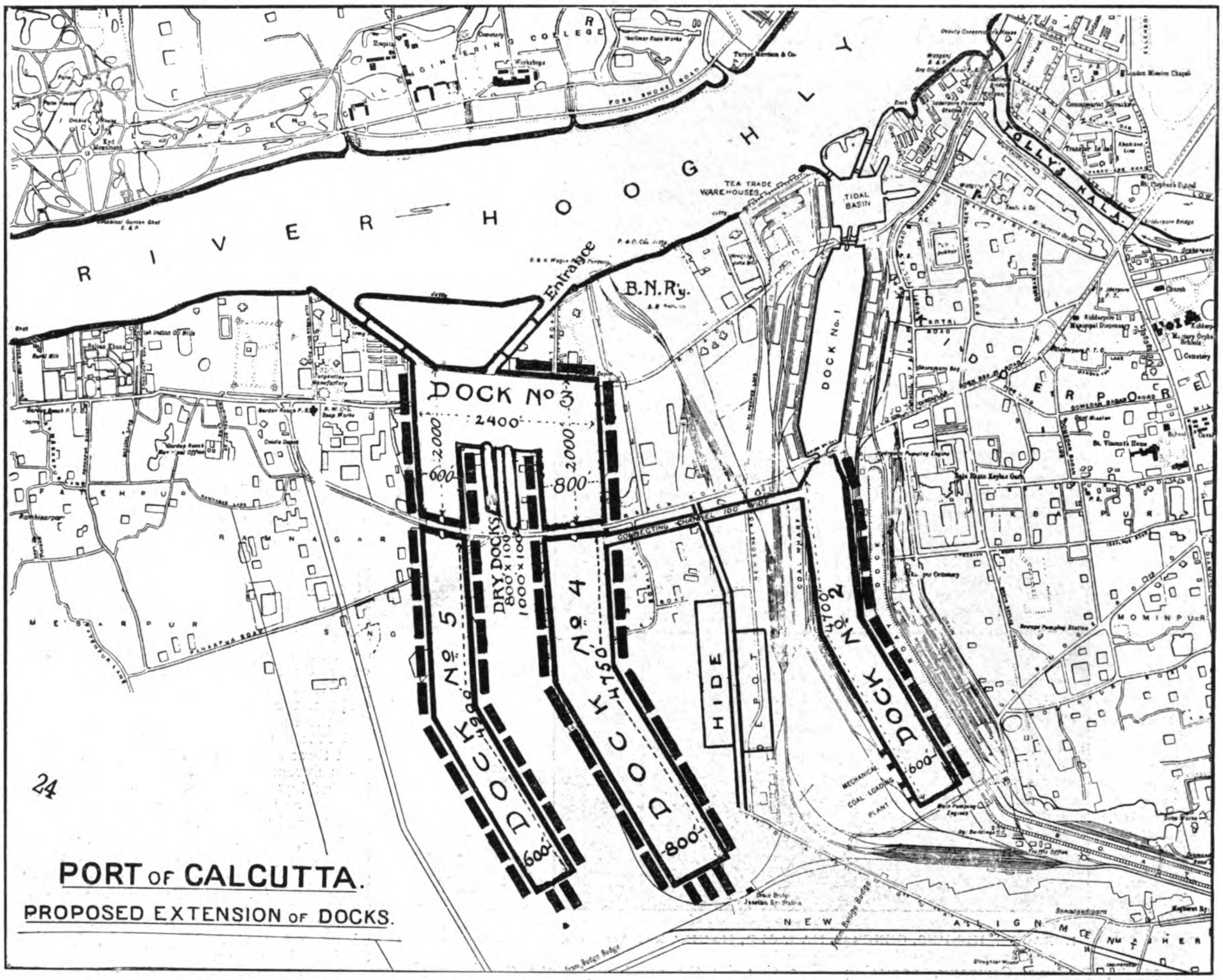
RAILWAY DEPT. OF THE HOKKAIDO COLLIERY AND RAILWAY COMPANY

Capital	12,936,800
Cost of construction	11,704,726
Estimated price of purchase	29,168,180

THE NISHINARI RAILWAY

Capital	1,650,000
Cost of construction	1,956,505
Estimated price of purchase	1,956,505

(Continued on page 135.)



PORT OF CALCUTTA.
PROPOSED EXTENSION OF DOCKS.

CALCUTTA PORT IMPROVEMENTS

From "Capital"

The plan which we publish as a Supplement in this issue illustrates the Port Commissioners' proposals for largely extending the accommodation for the trade and shipping of the port, and it is noteworthy that the ports of Calcutta and Liverpool should, so to speak, be simultaneously before the Government with proposals which are intended to cover the increase of trade extending over 30 years or more.

Many changes have been necessitated in the existing harbor works in consequence of the larger and larger steamers that are now employed in commerce. It is difficult to say what the limit of size will be, and when it will be reached. Steamers which were the largest ten years ago are now comparatively small boats. Therefore, the Port Commissioners of Calcutta are providing entrances sufficient for a steamer of 1000 ft. in length and beam of 100 ft., but the Liverpool authorities consider that a width of 130 ft. should be provided, and we shall probably find that when the detailed plans come to be considered, any alteration in the entrances will be in the way of making them wider than now proposed, for the plan now put forward is merely a preliminary scheme prepared, it is understood, with the object of illustrating what land must be taken up for the construction of docks on a scale sufficiently large to meet the rapidly increasing trade of the port.

The first work to be carried out in this great scheme is the completion of Dock No. 2, which will be 4,700 ft. long, 600 ft. wide, and have an area of 62 acres. On the east side there are to be 9 produce berths, 4 of which have just been sanctioned by the Government of India, and will at once be taken in hand. On the west side two mechanical coal loading berths are shewn, but the intention is to provide coal tipping appliances along the whole of the east side of the dock if the two to be first constructed should be as successful as is anticipated. This dock will give accommodation for 19 steamers of an average length of 500 ft., with ample water space for the free movement of vessels and for lighters bringing cargo to them.

The first of the new docks to be constructed will be No. 3 into which the two entrances already alluded to will give access from the river, one entrance pointing up stream and the other down stream so that the docking and undocking of vessels can be carried on at any state of the tide. The area of this dock will be 86½ acres, the greatest length 2,400 ft., and the greatest width 1,000 ft. Including the 4 riverside berths between the entrances this dock will provide 16 berths for vessels varying in size from 500 ft. to 650 ft. in length and a space is reserved for the construction of two very large Graving Docks. Dock No. 4, which is 4,750 ft. long, 800 ft. wide and 87 acres in area, will provide berths for 16 steamers varying from 500 to 700 ft. but actually steamers of any length may be berthed in it.

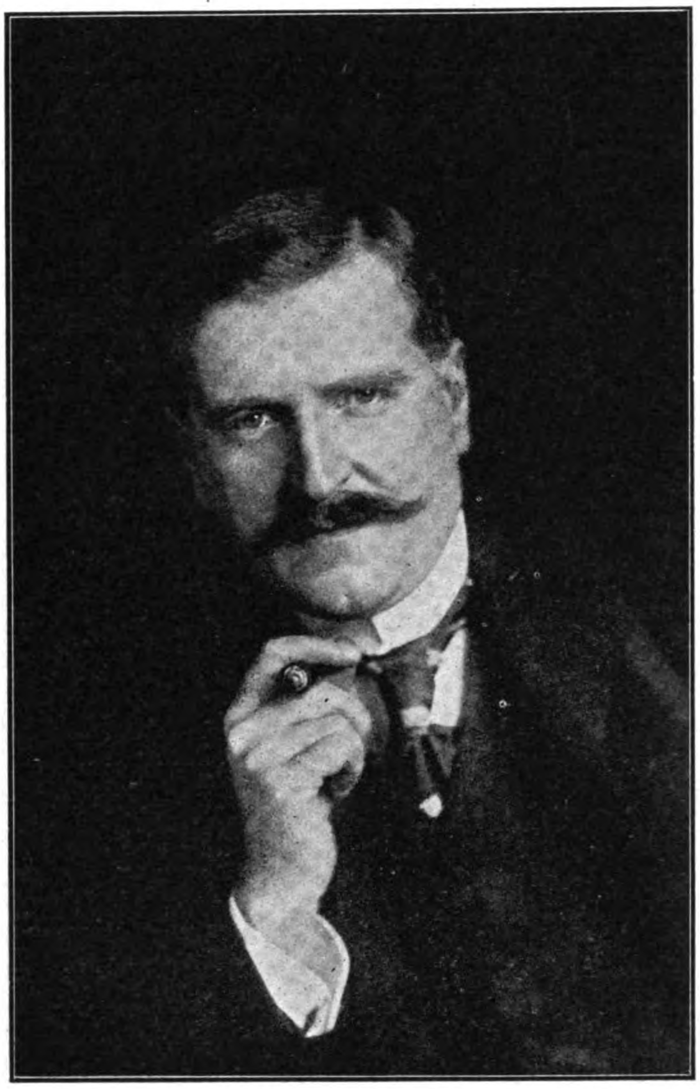
Dock No. 5, which is shewn as being 4,900 ft. long and 600 ft. wide, has an area of 67 acres and will have 20 berths for steamers of 500 to 600 ft. in length, but here, too, as in fact in all the docks, steamers of any length can be accommodated. The old and the new system of docks are linked up by a connecting channel adjoining docks Nos. 2 and 4, so that vessels from any one of the docks can be moved to any other dock without having to go out into the river. The total accommodation provides for no less than 62 berths with a quayage of 38,700 lineal feet in addition to the 21 berths and 11,400 lineal feet of quayage already existing.

The rail-borne traffic for docks of this magnitude must necessarily be very heavy and to provide ample space for dealing with this traffic, it is proposed to divert the E. B. S. Railway Co.'s Budge Budge branch 1,000 ft. further south, and, on the ground thus obtained, to put in at the east end receiving lines, in the central portion sorting lines, and in the western end standing sidings for the sorted traffic from which it can be distributed with the greatest facility to any of the berths.

Incidentally the carrying out of these works will result in low-lying swampy ground being raised to a good level, the sanitary condition of the locality being thus improved, while space is made available for business and even residential premises. The Commissioners in anticipation of this scheme have been quietly purchasing a large river frontage at Garden Reach, and are already in possession of more than half of the frontage land required.

The above is a brief description of the works, and we would add that they are an expansion of the present dock system and of the organization which has been carefully built up there on the experience gained of the specific requirements of the various sections of the trade, an organization capable of development concurrently with the growth of the trade under conditions which will afford the best working as well as the best financial results.

THE MANILA RAILWAY COMPANY



HORACE L. HIGGINS, GENERAL MANAGER, MANILA RAILWAY CO.

The Manila Railway Company, operating the only steam railway in the Philippines, between Manila and Dagupan, was organized in London in 1888. The concession for this road was secured from the Spanish Government for a term of 99 years dating from April, 1887, and during that period the Government guaranteed the interest, payable from the Philippine Treasury, of 8 per cent, on a capital of $4,964,000, which was subsequently increased to $5,373,700 from the extra cost of works authorized by the Government. The working expenses for the purpose of calculating the guarantee, was based on 50 per cent of the gross earnings. At the expiration of this concession the road was to revert to the State without compensation, and there was no option for the purchase by the Government at any time during the life of the franchise.

The Spanish Government regularly paid the guarantee, every there months up to 1897, but, on the change of sovereignty, the payments were stopped. The company, acting under the best legal advice, took the natural stand that, under international law, the United States assumed the obligations of Spain on the transfer of authority, while the American officials have contested the point.

This in addition to the claims of the Company for damages to their lines through insurrection, and for revenues while under control of the military amounting to $1,500,000 gold, has been a matter of diplomatic negotiation ever since, and was only settled on the signing of the recent contract for the new lines.

In 1903, the Company secured concessions from the Philippine Commission for the construction of three extensions to the man line, aggregating 87 miles, one to Camp Stotsenburg one to Cabanatuan, and the other to Antipolo. The Company as formerly organized had an authorized capital of $1,000,000 gold ordinary and $1,500,000 preference shares, with borrowing powers for $7,575,000. The headquarters are at 43 New Broad St., London, with the following Board of Directors:

C. J. C. Scott, (Chairman), A. von André, Admiral Sir C. A. G. Bridge, R. H. Bensen, R. Fleming and J. G. Le Marchant, Secretary, J. Mackenzie.

Two years ago, a controlling interest in the company was secured by Messrs. Speyer & Co., the well-known bankers of New York and London, and through this firm the negotiations with the government were carried out for the construction of the new roads.

The Hon. Cameron Forbes, in an article on the Railroads of the Islands, recently published in the anniversary number of the *Daily Bulletin*, has the following to say about the negotiations leading up to the new concessions:—

On June 20, 1905, Secretary Taft advertised proposals in Washington asking for bids for the construction of railways, and they were similarly advertised in Manila. The terms, which had been very carefully drawn under good advice, called for very good construction, early completion, and, in general, would have provided the Islands with an admirable system at an early date. There were eleven routes advertised, amounting in all to an aggregate of about 1,200 miles. The probable cost of construction of this number of miles was the extreme limit upon which the Government was authorized to guarantee bonds, as the bill provided that the amount of interest guaranteed could not exceed $1,200,000 a year. At the time these proposals were issued the Government had reason to believe that there would be at least three bids for the whole system.

On December 20, 1905, the bids were opened in Washington in the presence of the Secretary of War and Governor-General Wright. They were three in number, one for the whole of the island of Luzon, one for three of the Visayan islands, Panay, Negros, and Cebu, and one from a Seattle syndicate for the lines in southern Luzon in the provinces of Albay and Ambos Camarines.

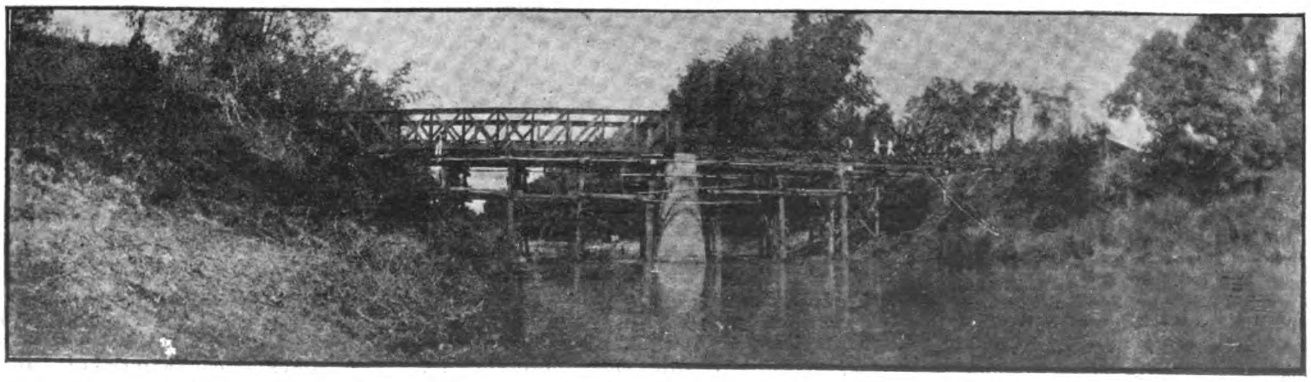
These bids were none of them in accordance with the terms of the proposals, differing in the following respects:

The Speyer syndicate did not ask for a guaranty but made many requests for privileges which were of such a nature that the Government could not possibly be justified in acceding to them as they would have laid it open to the charge of having given away the rights of the people. These included permanent low taxation, permanent high rates without right to regulate, and permanent immunity from competition.

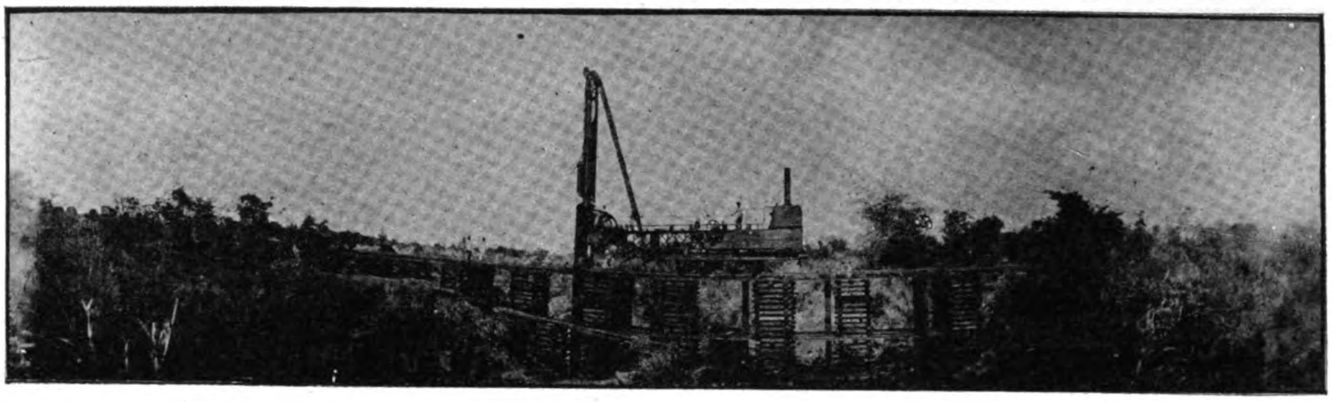
The Seattle syndicate did not deposit any check as guaranty, complying otherwise in every respect with the terms of the proposal.

The second call for bids was issued, to be opened on January 20, 1906. In the second call the following changes were made:

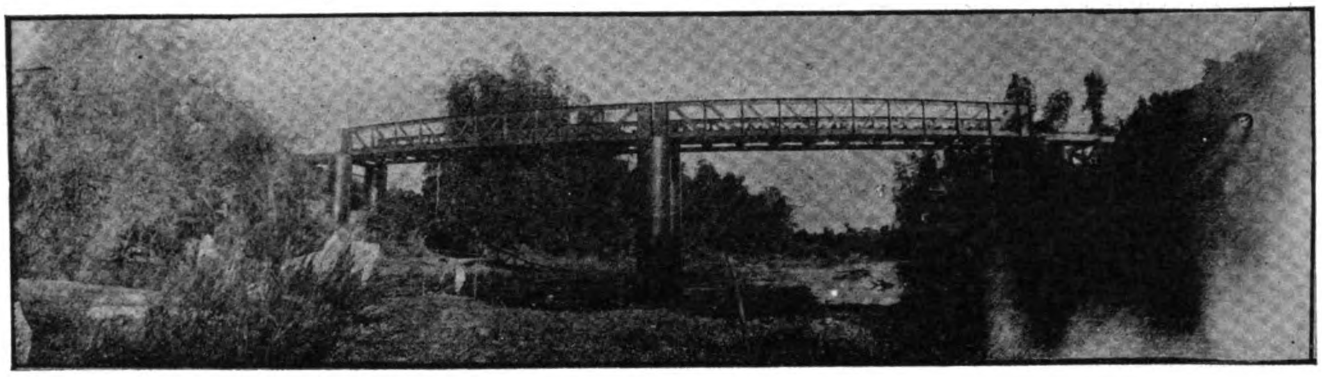
In the first place in regard to bids upon which guaranty was asked the amount of contractor's



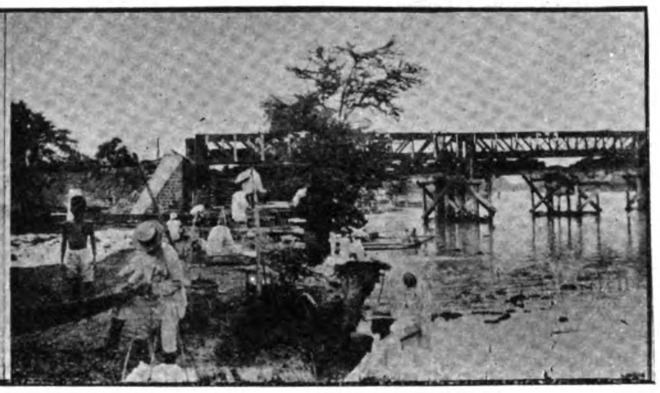
MANILA RAILWAY CO. ERECTING STEEL BRIDGE ON ANTIPOLO EXTENSION



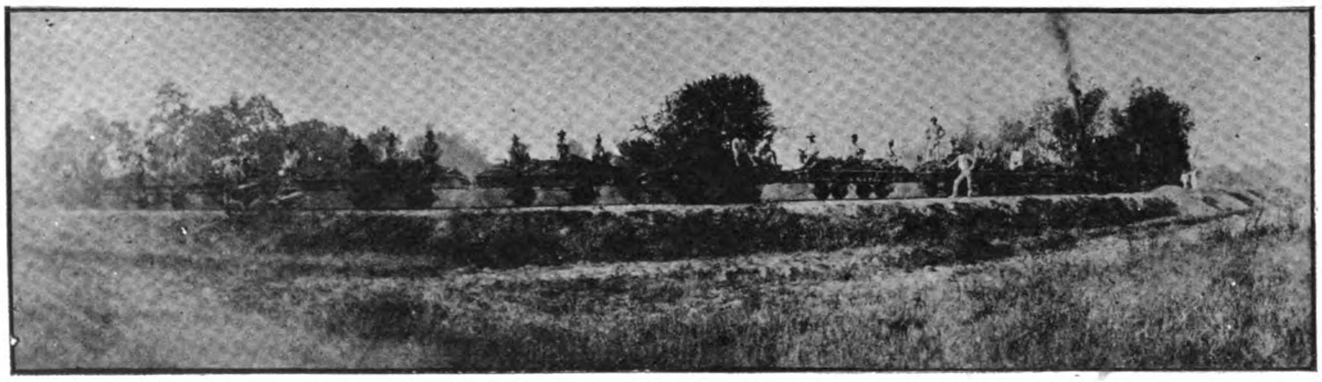
MANILA RAILWAY CO —TEMPORARY BRIDGE OVER A GULCH



MANILA RAILWAY CO.—NEW STEEL BRIDGE WITH CONCRETE PILE



MANILA RAILWAY CO.—BRIDGE ON CABANATUAN EXTENSION. STEEL BRIDGE OVER MARIQUINA RIVER, ANTIPOLO EXTENSION



MANILA RAILWAY CO.—CONSTRUCTION TRAIN

MANILA RAILWAY CO.—NEW STEEL FREIGHT, SHEDS, MANILA

profit was increased as requested by the Visayan syndicate and the period of time during which surveys and construction could be made lengthened. Other changes of a minor nature were also made.

In regard to unguaranteed lines propositions were requested, no restrictions being placed except that they must comply with the terms of the law.

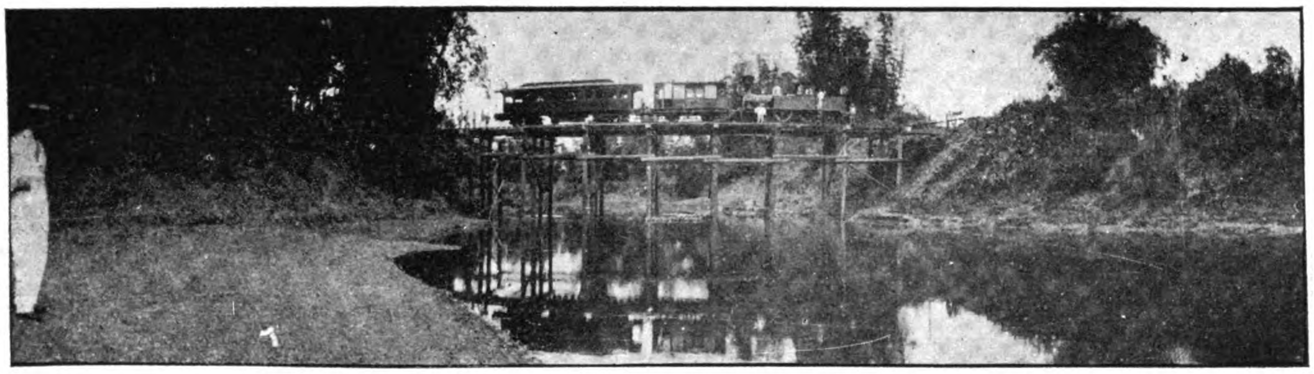
The Speyers this time offered two propositions, one of them for unguaranteed lines almost entirely as before, but eliminating some of the more objectionable features of their original proposition, and bidding in addition on a guaranteed line from Dagupan to Laoag, making in all some 400 miles of unguaranteed line, much of it short branches from the existing lines, and 160 miles of guaranteed line. Although modified so as to comply with the terms of the law yet the proposition of the Speyers still contained so many features that seemed objectionable that the award was withheld and negotiations entered into with them in the effort to have them so modify their demands as to make a proposition which the Government could be entirely justified in accepting.

After many months of negotiation this has at last been accomplished, Messrs. Speyer & Co. having reached an agreement with the Secretary of War, of the progress of which the Commission were kept cognizant and of which they entirely approve. In the course of these negotiations the plan to construct a guaranteed line from Dagupan to Laoag was abandoned and the result is that all of the lines in Luzon are upon one plan, namely, that of unguaranteed construction. On May 25, 1906, the following resolution was passed, formally awarding the concession to the Speyer syndicate and agreeing to pass an Act the terms of which had been agreed upon, word by word, by the parties interested, namely, The Philippine Government, the War Department, and the bankers:

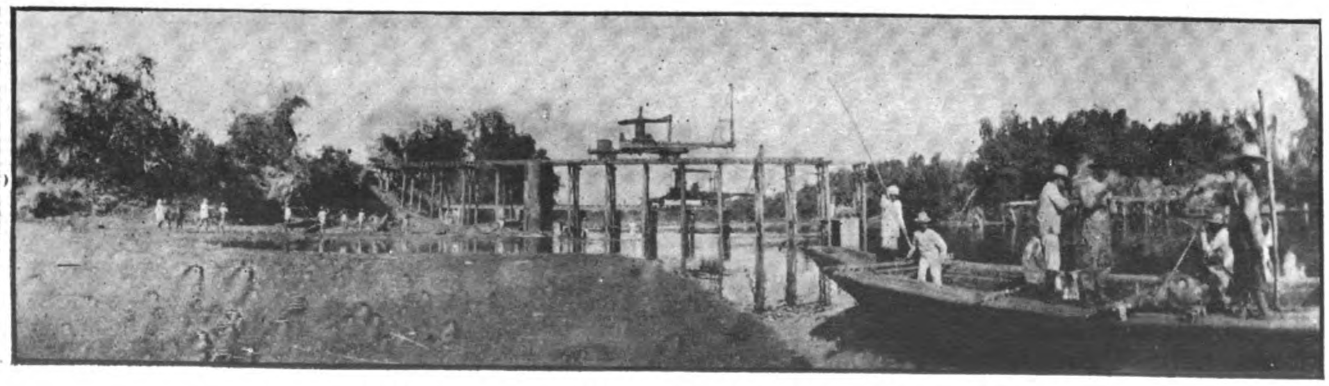
"WHEREAS, the Secretary of War and Vice-Governor Smith have reached an agreement with Messrs. Speyer and Company upon the terms of a concession for the construction of 428 miles, more or less, of railroad in the Island of Luzon, the construction and equipment of which they will agree to undertake; and

"WHEREAS, said agreement contained also a provision by which all of the railroad lines of the Manila Railway Company, Limited, whether built under the old Spanish grant or under concessions of the Philippine Commission will be transferred to a new company organized under the laws of one of the States of the United States and will be merged with the new system; and

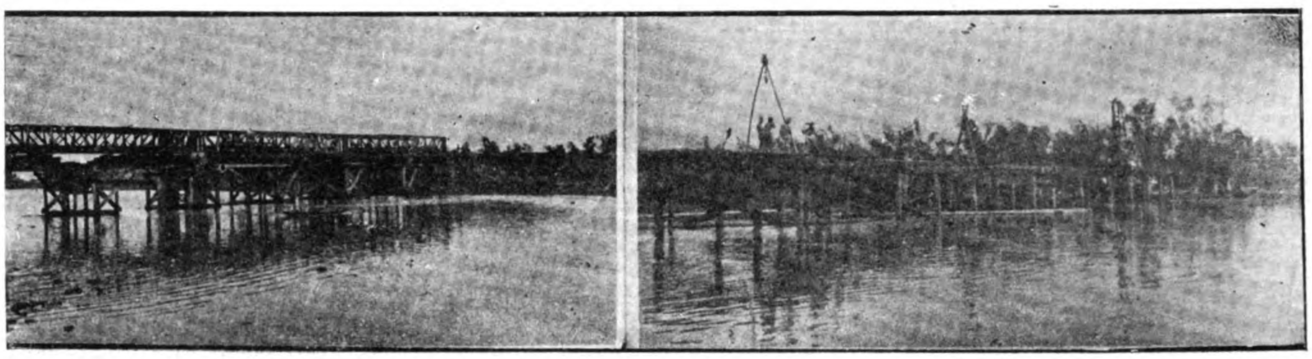
"WHEREAS, said agreement further provides that all claims of the existing railroad against the Insular, provincial, or municipal



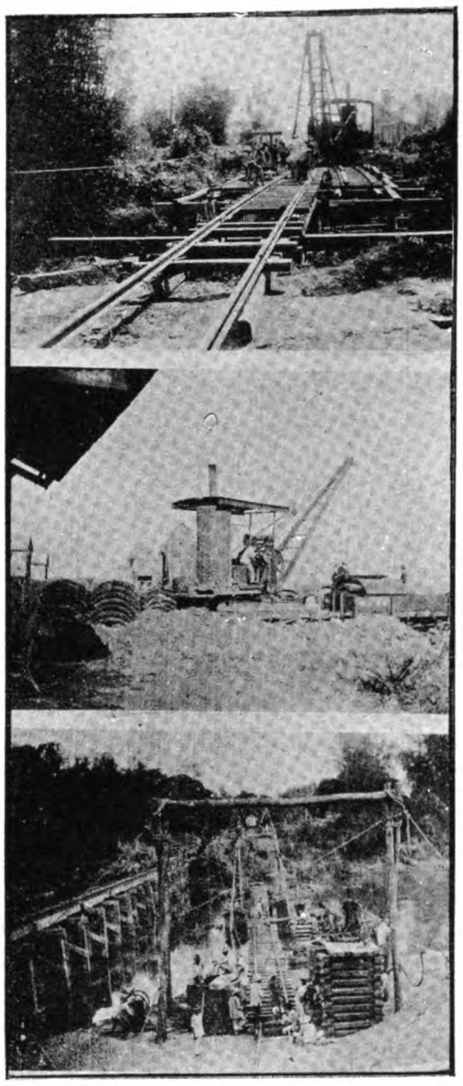
MANILA RAILWAY CO.—TEMPORARY WOODEN BRIDGE



MANILA RAILWAY CO.—ERECTING BRIDGE OVER SAN JUAN RIVER



MANILA RAILWAY CO.—ERECTING STEEL BRIDGES, CABANATUAN EXTENSION.



MANILA RAILWAY CO.—TRACK LAYING. CONSTRUCTION TRAIN BUILDING. CONCRETE PIER FOUNDATIONS.

governments of the Philippine Islands and the United States Government will be waived, and the original Spanish grant and concessions by the Philippine Commission for existing railroads will be terminated and merged in the new concession; and

"WHEREAS, it appears to the Commission that it is in the public interest that railroads be constructed in Luzon at the earliest possible date, and that the lines bid for are, on the whole, satisfactory and the terms proposed are such that the public interest will be properly protected if the same be accepted and approved;

"NOW, THEREFORE, BE IT RESOLVED, That the Commission hereby agrees to award to Messrs. Speyer and Company, of New York, a concession, the terms of which are to be the terms contained in the draft of a proposed Act copy of which is hereto attached, which provides for the construction and equipment of 428 miles, more or less, of railway in the Island of Luzon along the routes indicated in the attached draft and upon the terms therein set forth; and

"BE IT RESOLVED FURTHER, That in order that no time may be lost by the said company in making their arrangements to begin their surveys and other plans for early construction the Secretary of War is hereby authorized to give formal notice of such agreement to award; and

"BE IT RESOLVED FURTHER, That the Secretary of War be notified that, upon receipt of the name of the proposed railway company for which the concession is requested, the Commission will pass an Act in accordance with the terms of the accompanying draft, copy of which he now has in Washington."

The salient points in the Speyer's concession are as follows.

1. They agree to build 428 miles, more or less, of railroad throughout the Island of Luzon, including roughly 100 miles in Albay and Ambos Camarines, the line from Manila to Batangas and Lucena with branches, and several branches from the existing line of the Manila and Dagupan Railway, branching to the east and to the west, but principally to the east and including a line from Dagupan to San Fernando de la Union and a branch to the foot of the mountains within a few miles of Baguio.

2. No guaranty is asked on any of this construction.

3. While the rates are to be based on those now enjoyed by the Manila and Dagupan Railway the Government has the power to regulate them at any time.

4. The existing Manila and Dagupan Railway and all its branches give up their franchises, withdraw any claims which they may have against the municipal, provincial, or insular governments or the Government of the United States, and come in under the new charter on exactly the same basis at which the new lines go in.

5. The concession is a perpetual one.

6. There is nothing said in regard to competing lines, the Government being free to grant franchises for such lines at any time.

7. Taxation is one-half of one per cent of the gross earnings for thirty years; 1½ per cent for the ensuing fifty years, and thereafter to be fixed by the Government.

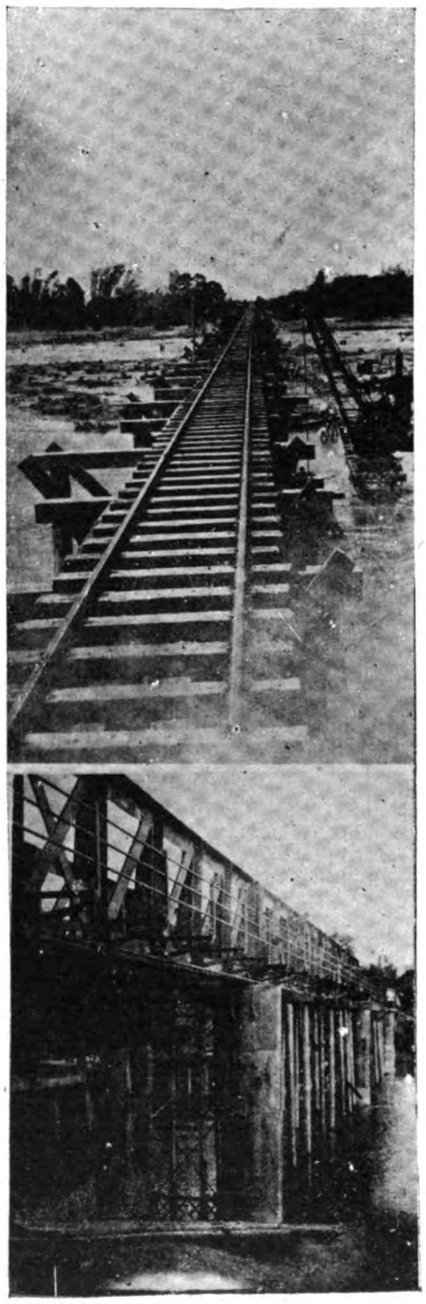
8. The company is given twelve months to complete its surveys and thereafter two years in which to complete the first 150 miles and agree to complete 75 miles each year thereafter. This does not compel particularly rapid action.

9. Right of entry of the material for the construction free of duty.

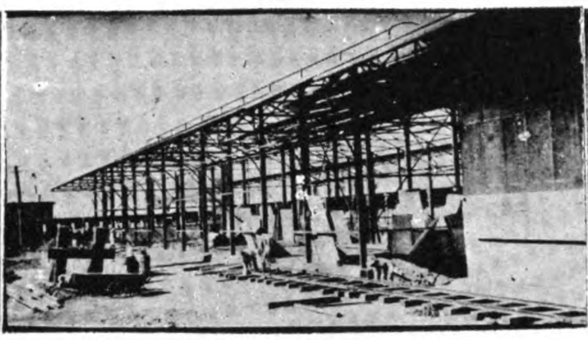
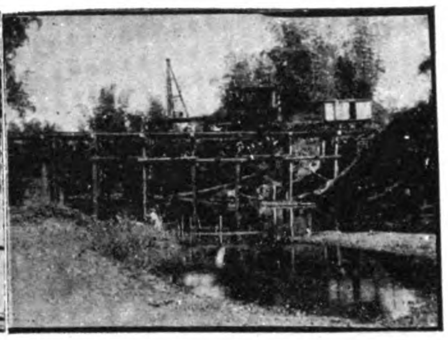
10. Privileges of using right of way 100 feet wide of the public domain, excepting always such part as is laid aside for public uses like parks, streets, etc., and such improved lands as the so-called Friars' Lands, etc., for which payment must be made.

11. Gauge to be three feet six inches and the quality of construction material to be up to first-rate modern standards with due regard to local conditions.

It will be seen that the public are to be amply protected by the above concession. Although



MANILA RAILWAY CO.—BRIDGE ON ANTIPOLO EXTENSION.

MANILA RAILWAY CO.—TEMPORARY BRIDGE. NEW STEEL FREIGHT SHEDS, MANILA.

the concession is a perpetual one the power of the Government to regulate rates and to grant franchises for competing lines assures the people of the Philippine Islands that industry cannot be choked either by exorbitant rates or by one railroad occupying the field and preventing any others from coming in. Others can be built whenever it seems advisable to so arrange.

In this enterprise the syndicate has a great advantage in the experience gained by the officers now in charge of the Manila Railway Company, Limited. Mr. Higgins is manager of this company and deserves a great deal of credit for the condition to which he has brought the property. In spite of light rails, the inexperience of native labor in railroad matters, the recent destruction during the insurrection, and the resultant depression in industrial conditions throughout the Islands he has succeeded in bringing his road-bed up to a very creditable condition and so maintains it. While the railroad is run on what seems to those used to American methods as a slow and cautious plan yet it is to be said to his credit that using wholly native engineers and conductors collisions are almost unknown, and the railroad is run as a profitable enterprise, continually building itself up which is the best criterion of good management. Mr. Higgins' wide experience, thorough training, and known ability are such as to be a guaranty that the work of construction about to be begun will be well and economically done.

TIES FOR PHILIPPINE RAILWAYS

A contract for the supply of one hundred and fifty thousand ties for the construction of the railroads in Panay, Negros, and Cebu has been awarded to Castle Brothers Wolf and Sons for the sum of 80 cents gold each. They will be imported from Australia, where a sufficient and immediate supply can be procured.

The Philippines Railway Company (J. G. White and Company) has also accepted a proposition of Macke and Chandler to furnish 1,500 ties of native hardwood. As far as can be learned this is the first lot of ties of native woods whose delivery has been arranged for.

In the course of a month or so a scheme for the cutting and delivery of ties by native woodsmen throughout the islands will be announced. The scheme contemplates direct dealings between the workman and the company. This is for the purpose of eliminating the "cacique" graft and giving the native who is willing to work a chance to make money by cutting ties in the forests. Arrangements are also to be made with the forestry bureau by which trees will be easier of access and the working in the woods more extensive than the regulations now allow.

SABANG BAY

FACTS ABOUT A GROWING COALING STATION

By Silas C. Penny

Such Oriental nomenclature as Singapore and Tandjong Pagar have been filling the columns of the home papers for many months, but, though casual attention was drawn to Sabang at the outbreak of the Russo-Japanese War, the promise and possibilities of Pulo Wey, the jewel of Acheen, have never been exploited by the itinerant scribe. And yet few of the earth's fledgling ports deserve an admiring chronicler more than this island coaling station. The subject is one of importance, not only from a local point of view, but also in a political sense; while the lover of beauty will find in the harbour a feast for his vision seldom met with even in the gorgeous East.

Two years ago, the Straits Press discussed the possibilities of Sabang, and though it was half admitted that in time of war the station might prove a thorn in the side of Great Britain, the idea of it becoming a mercantile depot of any importance was scoffed at. While often afraid of Dutch competition, it is customary for the Britisher out East to regard Dutch enterprise through an inverted telescope. After a stay in Sabang for several days, and a careful study of such signs as may be accepted as

FINGER-POSTS TO THE FUTURE,

I consider that the value of Pulo Wey cannot be overestimated. It is strange that the last writhings of Mother Earth as she passed through her apprenticeship of fire, twisted the tortured hills into gaunt shapes, which, when covered with tropical verdure, have become the loveliest spots of a lovely world. It is Nature's compensation to Nature. North Sumatra, the bold forelands of barbarous Acheen, are unmistakably volcanic, and are correspondingly beautiful. One of the sweetest sights on this coast is to be found as the little steamboat *Sabangbaagi* bustles from Olehleh, on the mainland, to the island of Pulo Wey. By this route, therefore, let us visit the "Dutch Singapore." The *Sabangbaagi* carries a motley crew, motley passengers, and in the way of cargo everything conceivable—from corrugated iron to cornice poles, from Dutch generals to cows in calf. Like everything else in Sumatra, it is commanded by a courteous Dutchman and manned by real natives—Malays—of Sumatran breed. Everywhere this scheme is adopted, and both the scheme and the natives work. "Malays," mark ye, my friends of British Malaya, who allow your natives to be hustled into commercial obscurity by hordes of imported Chinese!

Behind us, as we drop away from

OLEHLEH (PRONOUNCE IT "OOLALAY"),

the scene is daintily picturesque, the mainland mainly mountainous, breaking into curious rocky islets to starboard. Beyond these lie the sombre sentinels of the Bengalen Passage—Pulo Bras and Pulo Nasi Besar—with their serrated skylines and sharp peaks cowled in cloud. Almost dead ahead loom the lofty heights of Pulo Wey—grey, forbidding, inhospitable. If only the islands smiled a little more, the scene might have the Mediterranean for its setting. Nearing Pulo Wey, we find that it is almost uninhabited—that its gaunt steeps are a virgin land, its heights clothed in a thick cloak of jungle. A few miles further, however, and the rocky outline breaks into a spacious bay, and on the wide, white beach is seen a solitary hut, which, according to the skipper's yarn, is the home of the exiled Princess of Acheen.

Pulo Wey in a gale of driving rain and racing thundercloud is a sight to stir the blood. There is something primeval in the passion of this narrow sea. Pulo Wey in its more humble moods, with its quiet shore coves and occasional huts, homes of the cocoanut collector—the inevitable Chinaman again!—is also well worth the seeing. Beach, sea and jungle form

A HORIZONTAL RAINBOW,

and for miles between the steamer and the shore schools of porpoises gambol, some even playing around the prow of our craft, outstripping it with ease. The first sign of Sabang is a new lighthouse on a green headland; then two other prongs of land jut into the scene, and suddenly we see a number of lighthouses. These three capes form a double guard for the port, while the two outer ones curve inwards, claw-like, and thus protect the peculiarly deep-watered basin.

A few minutes later a couple of Dutch warships, very spick and span with their white and gold dressings glittering in the brilliant sunshine, tell us we are entering the small, but much-talked of, harbour of Sabang. When we swing to anchor, we find ourselves in a saucer of the island heights, suggestive of a crater, an ocean ante-room of haunting beauty. The open sea is no longer to be seen. We might be floating on one of the mountain lakes of Switzerland, only the foliage on the steep slopes is tropical and the heat is intense. Lining the shore are several dapper piers and wharfs, with a tangle of huge apparatus for coaling ships, large and small, a floating dock, and line upon line of long, low, iron-roofed offices, warehouses, and coalsheds.

A DIN OF MUCH WORKING

greets our ears. One warship is having her funnel repaired, the band of another is strenuously at practice, the colossal electric transporters moan as they toil, a noise as of distant thunder comes from the hull of the Liverpool steamer as she coals, while one or two Dutch cargo boats are fussily disgorging mysterious cargoes.

The houses of the station are built mainly on the further uplands of bay where the hills are less formidable, and there, too, flies the trusty old flag of Holland. Up there, also, where the island breezes blow unhindered, and the view of the bay is magnificent, stands a new and comfortable hotel, cosmopolitan enough to have an English billiard table, Bass's beer, and the *Sketch* in its reading-room. And the first words we hear on landing are those of a British captain thanking the manager of the Sabang Bay Harbour and Coal Company, Limited, for the surprising manner in which he had been

able to enter the port free of all charges, coal up, and get away within three hours of rounding the Oedjong Perimpuan. Directly afterwards we hear French, German, and, of course, Dutch spoken around us.

A PORT THAT AS AN INFANT

can be sucessfully cosmopolitan, and especially one that can attract British ships by the score, is in a fair way to attain permanent prosperity. The town is as well planned and ordered by the authorities as its sorroundings are by Nature. Six years ago it was a mere village, almost unheard of; to-day it is the pride of Sumatra, and the envy of half-a-dozen Governments.

Pulo Wey is eight miles in length and eight in breadth, with two bays, Pria Laoet and Sabang Bay on the north, and Balohan Bay on the south-east coast. Sabang Bay is completely sheltered against wind and sea throughout the whole of the year, while the other bays on the island are too deep near to the shore, and are not, therefore, always desirable. Fresh water is to be had *ad libitum*: indeed, mysteriously enough, two large fresh water lakes are perched a hundred feet above the Bay, and these reservoirs are fed by many rivers. Mountain breezes are generally coquetting with the confined bay, but when these are absent the heat of the hill-encircled harbour is intense. Mosquitoes swarm in their millions, but though you will find ten there to one in Singapore, they are of

A BENEVOLENT VARIETY AND SELDOM BITE.

Malaria is not unknown, of course, and the inhabitants fear the influence of the west monsoon, but generally speaking the Island is healthy and is particularly so for a beauty spot so typically tropical.

Even a Thames bargeman could make Sabang without a pilot. Within a few feet of the shore there is deep water, and there is no bar. The average depth of both entrance and harbour is about 20 fathoms. A pilot is provided by the Company mentioned above, but his assistance is not considered necessary by most skippers who have visited the station once. The entrance is about 2,460 ft. wide, and a Norwegian timber schooner, with her rudder jammed, ought to hit that. Sabang is just as easy to make at night as by day; a white light gleams out from the south-west side on Pulo Klas, and a red one from the opposite headland. There is a clear anchorage of 1,500 metres long by 500 metres broad, and the harbour will safely accommodate

BETWEEN TWENTY AND THIRTY BATTLESHIPS WITHOUT INTERFERING WITH TRAFFIC.

The bottom, being a combination of sand and coral, affords excellent anchorage. In addition to the harbour proper, hidden behind the island named Klas, on which the south-western lighthouse stands, is another anchorage, which may be gained by vessels not drawing more than 22 ft.—an ideal snuggery for torpedo craft.

Excepting the abundant military, the present and future of Pulo Wey seem to be in the hands of the Sabang Bay Harbour and Coal Company, and very excellent hands they are too. The manager is known amongst the inhabitants as

THE "KING OF THE ISLAND,"

and in spite of getting through an amount of work that would kill the average European in a month, he is a genial personage whom every skipper likes. The Company are monopolists, and provide the exception to the rule that monopolies are brakes upon the wheel of progress. The company employ many Europeans, who frequently work 10, 12 and 14 hours a day and business is becoming so brisk that the manager is crying for more and still more men. The Company's settlement is a large one. They possess some 2,000 ft. of wharfage, the long line of coal sheds alone are lettered from A to Z, there are 25,000 sq. ft. of storage room, workshops and offices, hotel, bungalows, coolie lines, a hospital, an ice manufactory, and a signal station. The

HUGE ELECTRIC TRANSPORTERS,

standing high above the village of coal sheds, are the most striking feature of the Company's settlement. They are of a most modern pattern, admirably adapted for the rapid work required of them. The same may be said of the floating dock, workshop and slip. The first-named, which occupies a sheltered position behind Udjong Perimpuan, is built for vessels of about 3,000 tons displacement and up to 360 ft. in length, and when docking they may draw up to 18 ft. The Company undertake all ordinary engineering repairs, and their charges for such work and for dock hire are the reverse of exorbitant. An American skipper was heard to exclaim, "Wal, I reckon that's the slippiest bit of coal humping I've seen outside the States. Didn't charge me any dues, and bunkered me right up inside two hours. Guess I'm quitting calling Dutchmen slow after this." And such seems to be the opinion of most captains who have had occasion to replenish their stock of fuel at Sabang. The Company boast that they have established records in coaling, and that they possess

"THE ONLY UP-TO-DATE EQUIPMENT IN THE FAR EAST."

Generally speaking, between 30,000 and 40,000 tons of coal are kept in stock at Sabang, and these are principally Welsh, Bengal, Japan, and Sumatran. The Company are favouring the Bengalese variety as giving better all round satisfaction to shipmasters. Only the best Japanese are used. The Netherlands Indian brands, though chiefly supplied to Government steamers and vessels of the coastwise trade, are by no means to be despised.

The Company have been able to attain their reputation for quick despatch by introducing the finest apparatus for the work yet invented. The four electrically-driven transporters, each weighing over a hundred tons, swing from shed to ship iron buckets containing 25 cwts. of coal each, and these giant feeders toil on both day and night. In addition to these machines, many hundreds of Chinese coolies and Port Said trimmers assist in bunkering. By day or night the Company can supply coals to a vessel at the rate of 100 tons an hour.

"Yes, if every you English cut a canal through the Peninsula above Penang, as you were once talking of doing," said the manager in the course of an interview, "then Sabang will

BECOME ONE OF THE FIRST COALING STATIONS IN THE WORLD."

"Doesn't it promise to grow into that now?"

"I believe so. We are working hard enough for it, and the fact that ships can always rely upon an adequate stock here, that when calling for bunker they are exempt from any charges whatever, must naturally go a long way to attract owners and masters to Sabang."

"The geographical position seems to be excellent?"

"It is. Steamers for the Far East via the Cape find Sabang particularly advantageous. They save considerable time in coming this way instead of by the Straits of Sunda. During the South-West Monsoon, steamers leaving the Straits of Malacca can fill up their bunkers at Sabang, and take the southern route to Cape Guardafui, thus being enabled to continue their voyage to Aden or Perim direct, or, as the case may be, to Suez or Port Said. Sabang is also the nearest coaling port between the Burmese rice ports and Japan."

It may be added that as a transhipment harbour Sabang's chief advantages are in that its storage rent and transhipment charges are less than those of neighbouring ports, and that other than these tariffs there are no import or export dues, no formalities, and no harbour dues, or for pilotage or lighterage. There is a fortnightly mail direct to Europe of the fine line of the Stoomvaart-Maatschappij "Nederland," which takes in enormous cargoes of tobacco from Sabang; and almost daily communication with Penang, Singapore, Batavia, Deli, and the west coast of Sumatra.
—*Syren and Shipping.*

MEAT INSPECTION

EXTRACTS FROM REPORTS OF THE NATIONAL MANUFACTURERS' ASSOCIATION AND INSPECTOR HEDRICK, SANITARY INSPECTOR OF CHICAGO.

Our investigation of the Canned and Potted Meat part of the packing industry showed that the methods used make the use of preservatives unnecessary, and indicated that no preservatives or artificial coloring is now used by the canned meat packer.

The meat is first partially cooked in large kettles, then the fat and bone is trimmed off and the meat packed into tins. The air is then withdrawn with vacuum pumps and the cans sealed in vacuum. Next they are put into large cookers where the cooking process is finished. In the packing of some products it is necessary that the cans be re-opened and the steam allowed to escape, the vent hole being immediately resealed while the goods are hot, so as to retain the vacuum.

The entire process is quite similar to that used by the family cook when putting up fruits and vegetables, except that meats are sealed in tin cans instead of being put in glass jars. We found that the solder in making the cans and in sealing them is all placed on the outside of the can and does not come in contact with the contents.

We were informed that much of the cause for complaint in canned meats was because of the mistaken idea that the goods would keep in perfect condition after they had been opened. This would be the fact if they were preserved with chemicals, but as they are only kept in condition because of being sealed in vacuum tins they spoil just as readily as fresh meats do after they have been opened and exposed to the air, but will keep indefinitely if the can is not punctured. It is also a well known scientific fact that decaying meat generates a gas which will explode any package which is hermetically sealed.

Sanitary Inspector Hedrick submitted to Commissioner Whalen his analysis of conditions in the Libby, McNeill & Libby plant. He found, "with reference to general conditions, that the floors, halls, stairs, tables, etc., are kept clean" and "that the entire department—viewed from our standpoint—was in a satisfactory condition. All workrooms are light, and have good ventilation.

ORIENTAL CONSTRUCTION COMPANY, LTD.

The Oriental Construction Company, Ltd., which has had a nominal office in Manila since January 1st, will begin active business here on or about September 1st. This company will be represented in the Philippines by a competent engineer, and besides undertaking all kinds of general construction work it will make a specialty of professional engineering in all its branches.

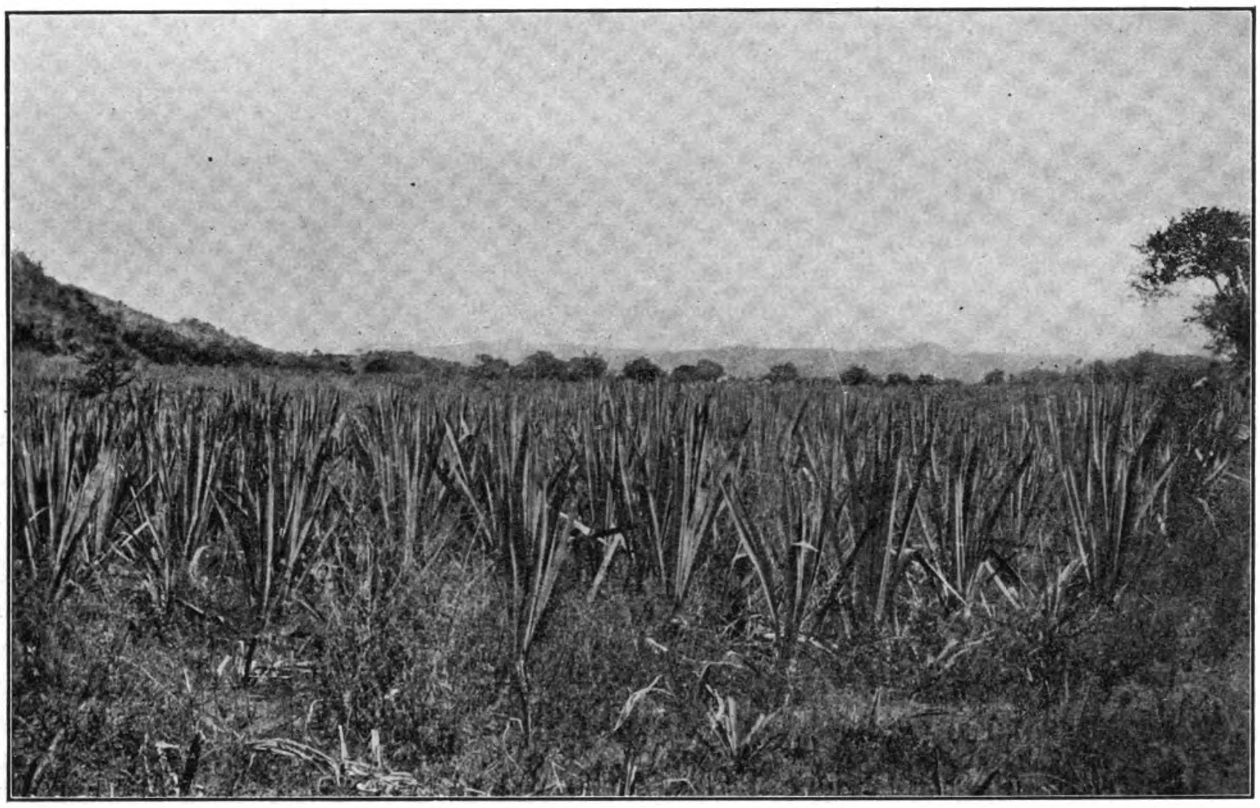
NEW FIBER MACHINE

The Atienza hemp cleaning machine, the invenfion of a Franciscan Padre of that name, has been placed on the market for sale by the Atienza Hemp Stripping Machine company which has had a lot of the machines constructed.

Those who have had the opportunity of seeing this machine at work and have been able to give expert opinion on the subject, declare that the little instrument is bound to work a great change in the methods now in vogue for the stripping of abacá fiber.

The new machine weighs only 20 pounds and will clean six classes of hemp and will produce in one day 30 pounds of fiber making a saving in fiber of at least 25 per cent over the old time method. The price of the machine, ₱60, brings it well within the reach of all, even the humbler cultivators of abacá.

Padre Atienza is a Franciscan parish priest who has spent many years among the hemp growers in the south of Luzon. The first machine or hemp cleaning knife invented for the stripping of abacá was also an invention of a Franciscan parish priest.



Photograph by Worcester. MAGUEY FIELD IN NORTHERN LUZON

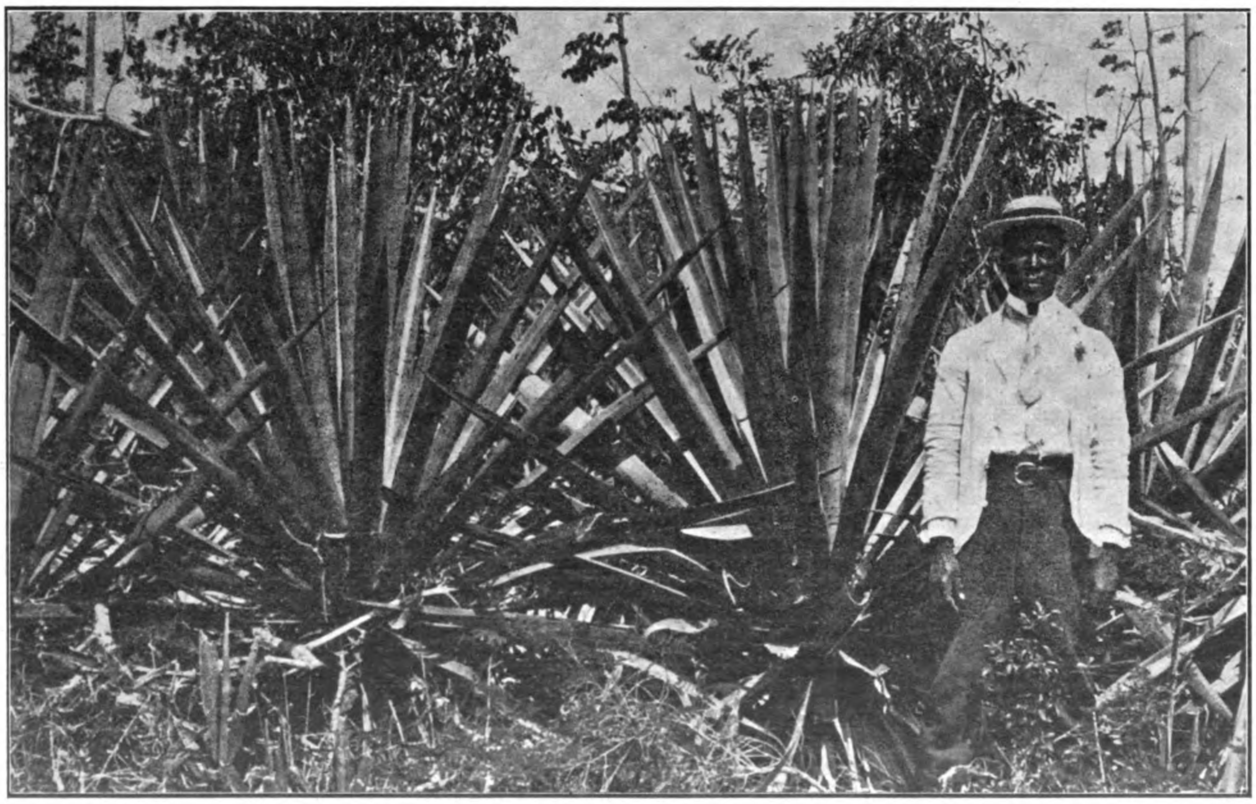
THE CULTIVATION OF MAGUEY IN THE PHILIPPINE ISLANDS

By H. T. EDWARDS, Fiber Expert to Bureau of Agriculture.

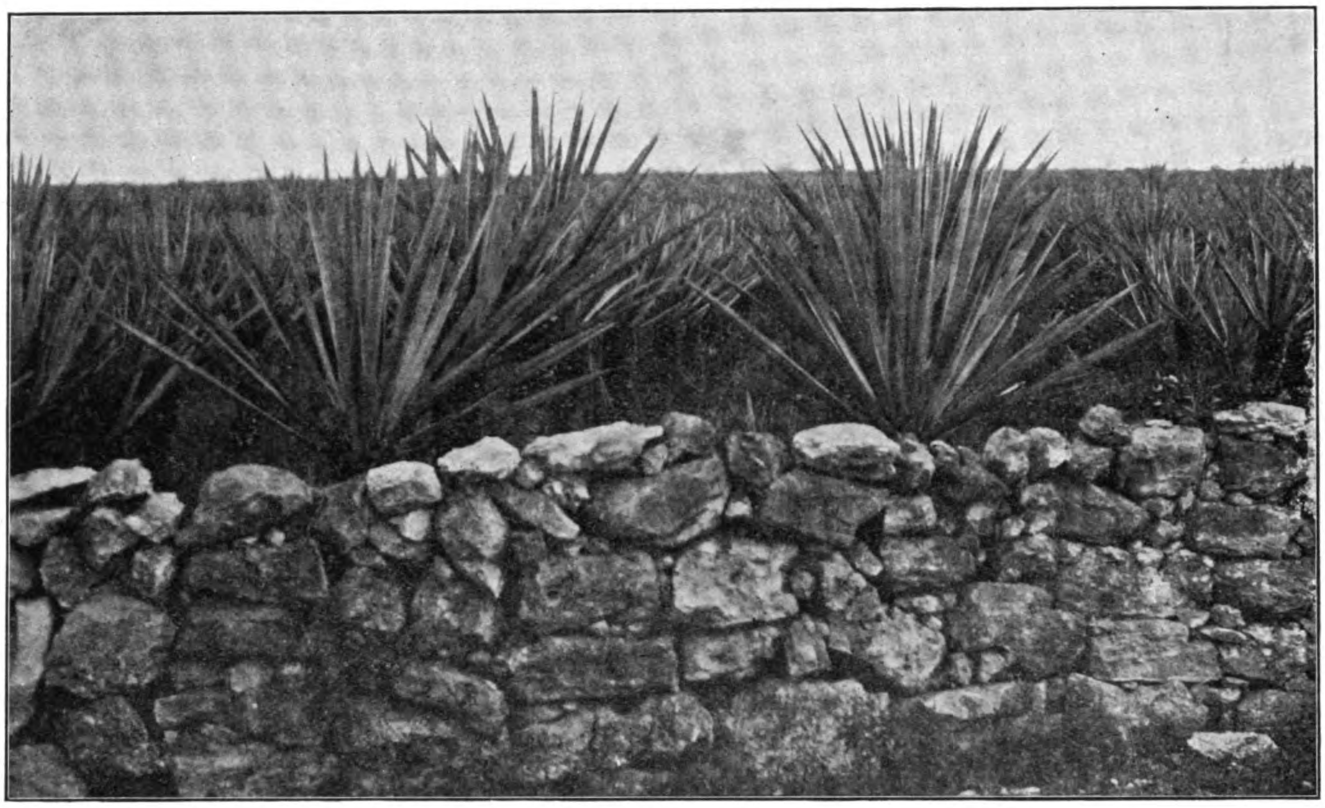
INTRODUCTION.

The essential feature of the maguey industry and that which recommends it to the Philippine planter is its peculiar adaptability to the conditions prevailing in many parts of these Islands.

These conditions are: A long dry season; large areas of arid, impoverished land; a limited supply of draft animals; the prevalence of insect pests and plant diseases; labor that is unaccustomed to the care of crops requiring intensive cultivation; and insufficient capital for the purchase of animals, implements, and machinery. In the cultivation of maguey we meet these conditions with a plant that grows and flourishes through the longest periods of drought; that requires for its best development a thin, rocky, limestone, or coral soil, and which can be grown in beach sand; that can be produced, on small farms, without the use of a single animal; that is not seriously injured by any insect or plant disease; that needs only a yearly,



Photograph by Dewey. SISAL HEMP, HAWAIIAN VARIETY



SISAL FIELD IN YUCATAN, SHOWING SYSTEM OF PLANTING IN ROWS

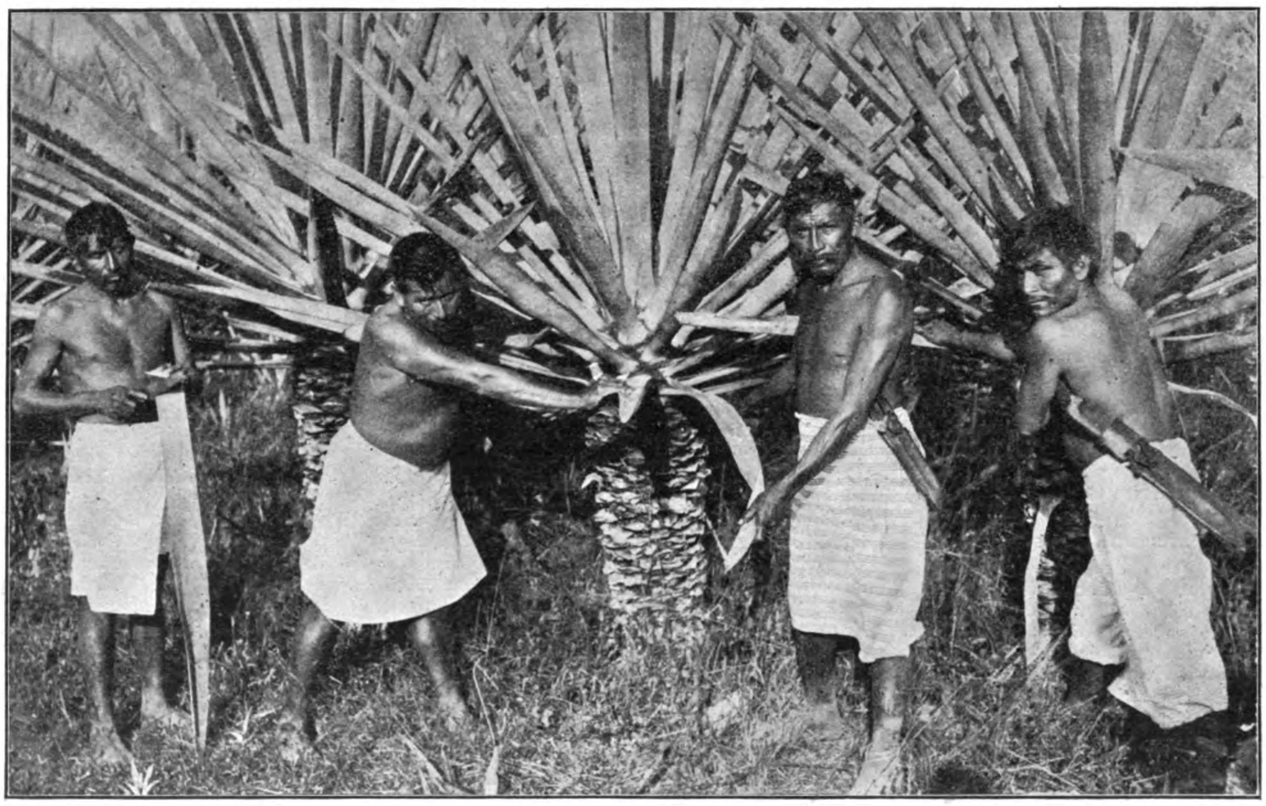
or semiyearly, cultivation; and that can, if necessary, be planted, cared for, and harvested with a "bolo."

The maguey plant of the Philippine Islands, the fiber of which is known in Great Britain as Manila aloe and in the United States as Philippine maguey, and the henequin plant of Yucatan, which produces the sisal hemp of commerce, are closely allied species of the genus *Agave*. These two plants have the same habits of growth and are propagated and cultivated by the same methods. The fiber-extracting machines that are used for sisal can be used, also, for maguey.

The production of sisal hemp has, within a comparatively few years, made Yucatan one of the richest States in the Republic of Mexico. The wonderful development of this industry is indicated by the imports of sisal hemp into the United States which were, in 1894, 48,468 tons, valued at $3,742,-073; and, in 1904, 109,214 tons, valued $15,-935,555, an increase in value of 328 per cent in ten years. The Philippine maguey industry, although on a much smaller scale, shows an equally encouraging growth. The export of maguey fiber from the Philippine Islands for the year 1901 was 875 tons, while for the fiscal year 1905 it was 1,878 tons, an increase of 115 per cent in four years.

This remarkable increase in the production of maguey has been effected in two different ways. The failure of other crops because of drought, insect attacks, or the scarcity of animals has led many Philippine planters first to investigate, and then to plant, maguey. The introduction of a modern fiber-extracting machine in Ilocos Norte has stimulated the industry throughout that province.

The establishment of this industry on a thoroughly satisfactory basis in the Philippine Islands requires three definite lines of improvement: First, *an improved system of planting*. It is the almost universal custom of Philippine planters to set out maguey plants but 2 or 3 feet apart. On the Yucatan sisal plantations it has been thoroughly demonstrated that planting in rows 12 feet



HARVESTING SISAL, SHOWING CORRECT METHOD OF CUTTING THE LEAVES

Photograph by Worcester.

HARVESTING MAGUEY

apart, with plants 4¼ feet apart in the row, will give more fiber per acre and fiber of better quality than where the plants are set out closer together. Second, *an improved system of cutting the leaves*. The Philippine planter frequently commences cutting when the plants are but one or two and a half years old. Following this first premature cutting, each year the plant is denuded of all but a few leaves. This system results in a weakened and stunted plant, and a considerable part of the immature leaves thus harvested contain but little fiber. The Yucatan system of cutting at one time only the mature leaves around the base of the plant keeps the plant always in vigorous condition, and gives more and better fiber. Third, *the use of fiber-extracting machines*. The Philippine method of retting is slow, expensive, and results in the production of inferior fiber. On all of the larger sisal plantations fiber-extracting machines are now used.

With the more careful selection of suckers for planting, a better system of cultivation, and more judicious cropping, it is only reasonable to expect that the maguey plant which we now have can be improved. Furthermore, the true sisal plant, *Agave rigida sisalana*, which has been imported from Hawaii and is now being grown in the Philippine Islands, gives promise of satisfactory results. The machine question is not a difficult one, as the machines required have already been perfected after long years of trial on the sisal plantations of Yucatan. The wide distribution of maguey throughout the Islands, and the very general interest that is now being shown in this plant, will greatly facilitate the development of the industry.

HISTORY AND DISTRIBUTION OF MAGUEY.

The fiber of the henequin, or sisal hemp, plant has been utilized in Yucatan for centuries, but only within comparatively recent years has it become an article of commercial importance. The industry is supposed to have been started in Yucatan by the Toltecs about A. D. 1016. In 1783 a commission appointed by the royal Spanish navy investigated this fiber and reported favorably concerning it. In 1839 an association was formed in Yucatan to promote the cultivation of henequin, but, owing to the fact that at this time all of the fiber produced was extracted by the use of crude, wooden implements, the industry was not a profitable one. Realizing the need of a fiber-extracting machine for henequin, the State government offered a reward of $10,000, Mexican, to the inventor of a satisfactory machine. This offer resulted in the invention of the "raspador," from which have come the improved, automatic machines that have made the sisal industry what it is to-day. In 1875 the total export of sisal hemp from Yucatan was valued at $710,124, Mexican. In 1900 it had increased to $22,616,032, and in 1904 it was $32,022,563.

From Yucatan, sisal hemp has been introduced into Florida, the Bahama Islands, the Caicos Islands, Mauritius, the Hawaiian Islands, Cape Colony and Natal, West Africa, Australia, and India. In the Bahamas the sisal industry has attained considerable proportions and is now firmly established. The exports of sisal from the Bahamas are now valued at about $200,000 per annum. In Hawaii 20,000 sisal plants were imported by the commissioner of agriculture and forestry in 1893. Some years later the Hawaiian Fiber Company was formed and it now has 850 acres of sisal under cultivation. It was estimated in 1903 that fully 10,000 acres of sisal had then been planted in Hawaii.

DISTRIBUTION OF MAGUEY IN THE PHILIPPINE ISLANDS.

The maguey plant was probably first introduced into the Philippine Islands from Mexico. It is now known, and is utilized for local purposes, in nearly every province of the Archipelago. Until quite recently the production of maguey as an article of export has been confined to the Provinces of Ilocos Sur and Ilocos Norte. During the past three years, however, many planters in other provinces and islands have given their attention to maguey, so that to-day the industry has obtained a foothold in a number of provinces. The provincial governor of Cagayan has recently reported that 263 hectares of land in that province are now planted in maguey. The provincial governor of Batangas states that in the one town of Nasugbu there are now 6,000,000 maguey plants. From the Provinces of Union, Pangasinan, and Zambales, and from the Islands of Cebu and Negros reports have been received which show that the maguey industry in these districts has passed beyond the experimental stage.

THE PLANT.

The henequin of Yucatan, *Agave rigida elongata;* the sisal of Hawaii, *Agave rigida sisalana;* and the maguey of the Philippine Islands, recently identified at the Royal Botanic Gardens, Kew, as *Agave cantula*, are very similar plants. All have the short, thick stem; the aloe-like cluster of large, fleshy leaves; and the tall flower stalk, or "pole," which bears a large number of small bulbils, or pole plants. The Hawaiian plant differs from that of Yucatan in having a shorter trunk; leaves smooth-edged, or bearing a few unequal teeth; and the fiber less in quantity, but superior in quality. The Philippine maguey plant has a short trunk; leave from 4 to 6 feet long, from 2¾ inches wide at the base to 4 inches wide at the middle, and about 1 inch thick at the base; lateral teeth three-fourths to 1¼ inches apart; dark-brown terminal spine one-half inch long; and fiber finer, white, and longer, but less in quantity than either the Yucatan or the Hawaiian varieties.

THE FIBER.

The fiber of maguey is derived from the leaves, and is obtained by separating the pulpy portion of the leaf from the fine filaments, or fibro-vascular bundles, which run through this pulp. The fiber is white, or yellowish-white, in color, 4 to 5 feet in length, fine and soft, and more wavy or fluffy than abacá. Another marked quality is its elasticity, which gives it great value when used for cordage that is liable to be subjected to any sudden strain. In strength it is inferior to abacá, but superior to coir, jute, sunn hemp, and Russian hemp.

CLIMATE AND SOIL.

Maguey, if planted in a well-drained soil, will grow in almost any part of the Philippine Islands. Unlike abacá, it requires neither a large, nor a continuous supply of moisture, but rather an excess of hot, dry weather. It is evident, therefore, that the provinces best adapted to the cultivation of maguey are those where there is a long dry season and a light rainfall. With an abundant supply of atmospheric moisture and a rich, moist soil this plant will grow and flourish, but under these conditions the leaves develop a large amount of pulp and small percentage of fiber.

A thin, rocky, limestone soil, or one made up of partly decomposed coral rock, is best suited for maguey. As the roots of the plant are very sensitive to an excess of moisture, it is most essential that the soil be well drained. Although maguey is frequently found growing in almost pure beach sand, the conditions under which the plant can be most profitably cultivated are indicated by the following statement relative to sisal hemp cultivation in the Bahama Islands:

I have both read and heard it broadly asserted that sisal will grow and flourish anywhere, no matter how sterile or impoverished the land may be. My observations, however, do not confirm this. I do not mean to convey the idea that *really good rich land* is necessary for its successful cultivation, but merely to remove the impression, if such there be, that the plant will thrive in dry arid sand, or on rocky land void of soil. Worn-out "provision" and pineapple fields appear to be well suited to its cultivation, while on broken, rocky surfaces, containing innumerable "pot holes" and crevices, in which is deposited the ordinary black or red earth, the plant luxuriates. (Bulletin Royal Kew Gardens, London, 1892.)

THE PLANTATION.

The use of fiber-extracting machines in the Philippine Islands introduces a new and important factor in the maguey industry. Heretofore the Ilocos planters have usually grown maguey in connection with other crops. Rice and corn have been planted on the lowlands where there is an abundant supply of water, and maguey in small "patches" on the rocky hillsides and on any available waste land that could not be used for other purposes. There has been no demand for a large, or for a regular, supply of leaves in any one locality. It has, in fact, been impracticable for any one planter to handle satisfactorily the output of a large plantation. This situation is exactly reversed when a plantation, or a community, is equipped with a fiber-extracting machine. As one improved automatic machine will clean from 50,000 to 150,000 leaves per day, the continuous and profitable operation of such a machine requires a supply of leaves that can only be produced on one large plantation, or on several smaller plantations in close proximity to each other. Even with one of the smaller machines cleaning from 10,000 to 15,000 leaves per day, the planter will be able to handle a far greater number of leaves than has been possible where the fiber has been cleaned by retting. While it is not to be expected that the old method of cleaning fiber will be immediately, or entirely, superseded by the use of automatic fiber-cleaning machines, the more general use of such machines in the Philippine Islands is only a question of time, and with their use will come the establishment of larger and more systematically managed plantations.

A maguey plantation to be economically and profitably worked should consist of a fairly large area and should be reasonably level, so that all parts of it can be reached by good roads. The location having been selected and the boundary lines carefully located, the plantation should be mapped and laid out in fields or sections. The maguey planter has always to consider the question of transportation. Maguey leaves should be cleaned within twenty-four hours after cutting, and as every picul of fiber produced means the hauling of approximately two tons of green leaves from the field to the machine, and as the operation of one of the large machines requires from 40 to 100 tons of leaves per day, the need of having both cheap and quick transportation is apparent. With this end in view, the site selected for the fiver extractor, the baling press, and the storage sheds for fiber should be as centrally located as possible. From this point a main road, or roads, sufficiently wide to allow the use of wagons and also a portable track for cars, should extend through the plantation. Cross roads may be about 200 feet apart.

One of the first things to be done on a newly established plantation is to start a nursery where a supply of plants can be propagated from bulbs or pole plants. Even though suckers may be available and cheap, a good nursery will more than pay for the cost and trouble of its maintenance. Two or three acres of good well-drained land may be selected for this purpose, and this land should be thoroughly plowed and harrowed. The bulbs, which can be secured in quantity from any old plantation, are planted in rows 18 inches apart and 9 inches in the row. In one year the nursery plants should be from 15 to 18 inches high, when they may be transplanted to the field.

PROPAGATION.

Maguey is propagated in two ways, from the small "pole" plants, or bulbils, that are produced on the flower stalk, and from the suckers which grow from the roots of the older plants. When a maguey plant reaches maturity it throws up a tall flower stalk 15 or 20 feet high. On the lateral arms of this flower stalk are born a large number of blossoms and from these blossoms develop small plants 2 to 4 inches in length. These plants fall to the ground when mature, and may then be gathered and set out in the nursery.

The second, and more common, method of propagation, is by the use of the suckers which grow from the roots of the older plants. When a maguey plant is from twelve to eighteen months old it commences to throw out underground runners, or rhizomes. The point of one of these runners, upon reaching the surface of the ground, forms a sucker, or shoot. From 30 to 40 suckers will be produced by one plant during the first three or four years of its life, after which the number decreases. Where it is possible to obtain suckers cheaply, and in sufficient quantity, this method of propagation is quicker and more satisfactory than the growing of plants from bulbils.

FIELD PLANTING.

Where arid, rocky land is used for maguey there is usually but little preliminary clearing required. Any underbrush, or other growth, should be cut and burned during the dry season. As maguey feeds heavily upon potash, the ash that is left from this refuse will furnish valuable fertilizing material. The land, having been cleared, may be quickly lined out for planting by using two poles the length that the rows are to be apart, and a line, knotted at the distance apart which the plants are to be set. If the land is not of such a rocky character as to make plowing impracticable, it is well to plow several furrows along the line of each row of plants. Where other crops are to be grown with maguey the entire field should be plowed.

The suckers that are to be used for planting may either be taken from the old fields and set out at once in the new plantation, or they may be thrown in heaps and allow to lie in the sun for six or eight weeks. The latter method is very generally followed on the

Photograph by Worcester. CLEANING MAGUEY BY "RETTING."

Photograph by Worcester.

MAGUEY FIELD. (THE RESULTS OF OVERCROPPING.)

Yucatan sisal plantations, and the suckers so treated are said to produce larger and stronger plants than where they are taken direct from one field to another.

The system of maguey planting in the Philippine Islands differs materially from that of sisal planting in Hawaii and Yucatan. Maguey is usually set out but two or three feet apart each way, with the result that when the plants mature the fields become an almost impenetrable jungle. Various systems have been tried by planters in other countries. Some have planted as near as 6 feet apart each way, others as far apart as 9 by 11. With too close planting many leaves are torn and lacerated by the spines of adjoining plants, and the work of cultivation and harvesting is rendered extremely difficult. On the other hand, where the distance is too great, there is unnecessary waste of land. After long experience the Yucatan planters have generally adopted the row system, with plants 4½ feet apart in the row and rows 12 feet apart, giving approximately 2,000 plants to the hectare. The advantages of the row system are that it facilitates cultivation; admits air and sunlight which are necessary to harden and strengthen the fiber; expedites the work of cutting and handling the leaves; and gives room for replanting when the old plants are approaching maturity.

An improved system of planting is a reform that is urgently needed in the Philippine maguey industry. Close planting and water retting belong to the same period. With the introduction of fiber-extracting machines should come a system of planting that shall give us cultivated maguey fields where now we too often find only tangled wastes.

CULTIVATION.

A maguey field, after it is once well established, requires but comparatively little attention and cultivation. Where the suckers have been set out with reasonable care, the loss will be small. Two or three times a year the fields should be cleaned of weeds and grass, care being taken not to bruise the leaves of the growing plants, as any such injury will result in a discoloration of the fiber. Suckers will begin to grow from the roots of the old plants in from twelve to eighteen months, and such as are not required for setting new fields should be removed and thrown away. The growth of a large number of suckers on any one plant not only lessens the vitality of the plant but also tends to hasten the growth of the pole.

As maguey yields no return for three or four years it is sometimes desirable, while the plants are small, to cultivate another crop on the same land. The practicability of doing this will depend largely on the nature of the soil, maguey frequently being grown on land that will produce no other crop.

At the Grenada Botanical Station, in the Windward Islands, one-half of a sisal field was planted with corn. It was noticed that the small sisal plants shaded by the corn made far greater progress than those without shade. (Bulletin Royal Kew Gardens, London, 1892.)

In the Bahama Islands similar results have been obtained with both corn and cotton. These crops are not only beneficial in furnishing shade, but they also keep down the weeds, and yield a product of more or less value. Camotes (sweet potatoes), which are frequently planted in abacá fields, should not be planted with maguey, as the vines would soon entirely cover the small plants and retard their growth.

The early or late poling of the plant is a consideration upon which may depend the entire success or failure of the industry. It is essential with a crop that yields no return for from three to five years after planting, that it shall continue productive for a considerable number of years without replanting. In the case of maguey the growth of the pole, which is soon followed by the death of the plant, is in part the result of natural conditions, and in part depends on the variety and care of the plant. The life of the Yucatan sisal plant, after the first cutting of leaves is from ten to twenty-five years; while that of the Bahama plant is from five to eight years. The longer life of the Yucatan plant is due to difference in variety, climatic and soil conditions, and the more careful system of cropping of the Yucatan planters. A humid climate and a moist soil tend to bring on early poling. The careless cutting of leaves, and either long delay in cutting or overcropping, have the same result. If the pole is lopped off as soon as it appears above the leaves, the life of the plant will be prolonged a year or more, allowing the leaves then on the plant to mature.

HARVESTING

The number of years required for the production of the first cutting of leaves is variable, depending on the size and condition of the suckers when planted, subsequent climatic conditions, and the nature of the soil. Ordinarily the first crop of leaves will mature in three or four years. In Hawaii the first leaves are cut at three years from the time of planting in the field, or four years from the time of setting bulbils in the nursery. The Yucatan henequin requires from four to seven years to mature the first leaves.

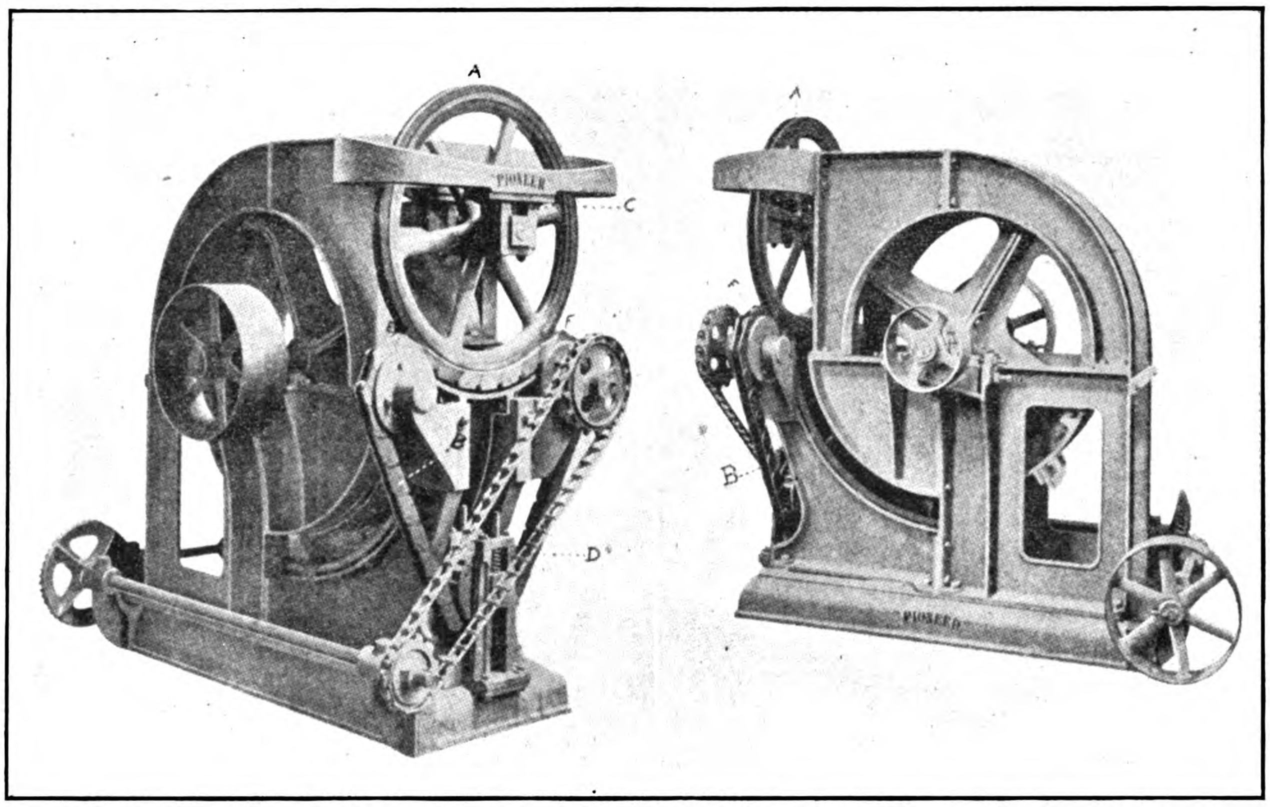
It is customary to harvest maguey once a year, preferably during the dry season. In the wet season the leaves contain a smaller percentage of fiber, and the frequent rains interfere with the work of drying. Each plant should yield from 15 to 30 leaves annually. There is no fixed rule governing the time for cutting the leaves, and this matter is one to be determined largely by judgment and experience. Only those leaves should be cut which incline toward a horizontal position and show signs of maturity. As too much cutting will soon destroy the strongest of plants, constant care should be exercised against overcropping.

The harvesting of sisal in Yucatan is done principally by Indians, who do this work with "corbas," the corba being a bolo having a blade curved at the end. An average day's work is from 1,500 to 2,000 leaves. Following each cutter is a woman, or boy, who cuts off the thorny sides and end spine of the leaves, and makes them up into bundles of fifty. These bundles of leaves are carried out to the roads, and transported on small tram cars to the cleaning machine.

EXTRACTION OF FIBER.

Maguey leaves should be cleaned within twenty-four hours after they are cut from the plant. If left for a longer period than this the fiber will become discolored at the ends.

An average leaf of maguey is from 4 to 6 feet long, weighs from one to two pounds, and is about one inch thick at the base. It consists of a mass of cellular tissue, through which run the fibro-vascular bundles, or fibers.



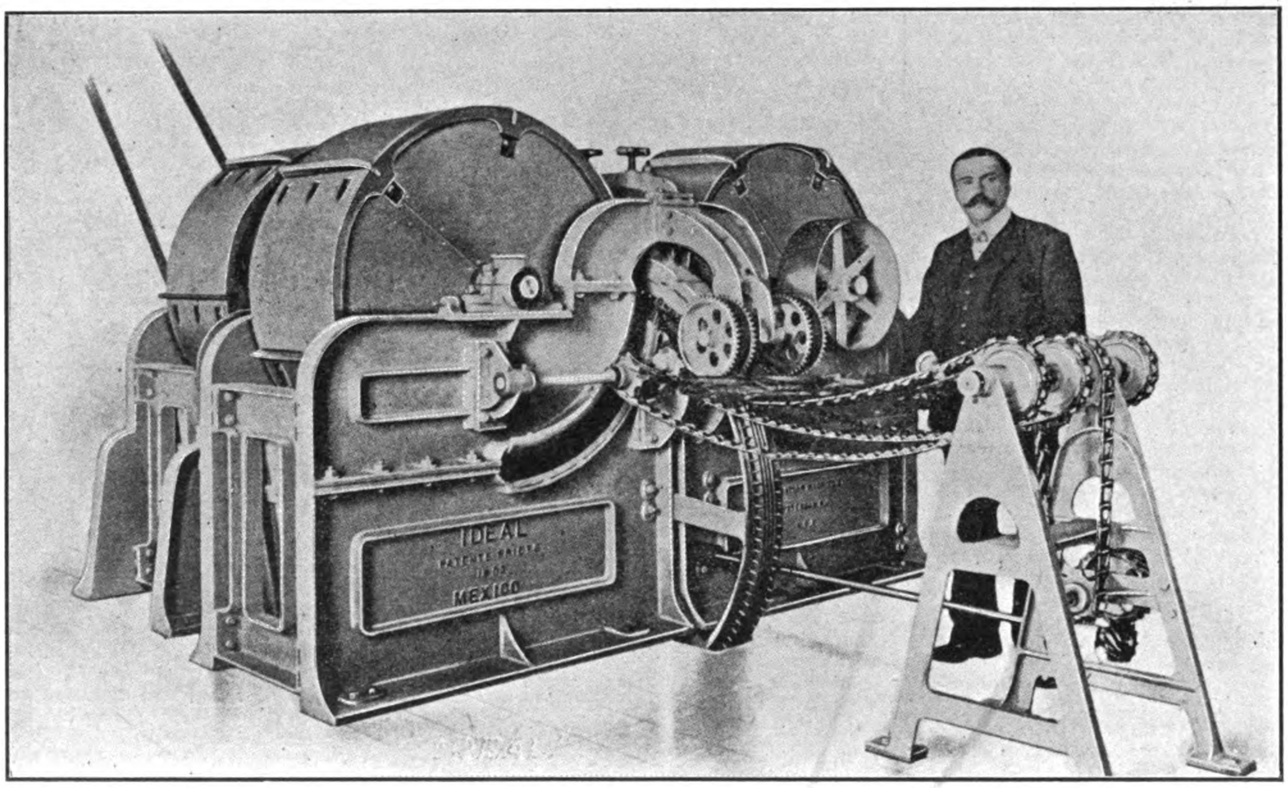
"PIONEER" FIBER-EXTRACTING MACHINE

The work of fiber extraction consists in separating the pulpy portion of the leaf from these fine filaments. There are two general methods by which this end is accomplished. The leaf may be placed in water until the pulp becomes so rotten that it can be easily removed by washing and beating; or, the leaf while still green may be treated to some scraping process that removes the pulp and leaves the cleaned fiber.

The first of these methods, known as "retting," is the way in which maguey fiber is ordinarily cleaned in the Philippine Islands. In the retting process the leaves are first cut from the plant and the thorns and spines are removed. These leaves are then beaten and crushed, cr are split into several pieces, and are frequently made up into small bundles. These bundles are placed one upon another in the tidewater of some nearby river or creek, where they are allowed to remain from seven to fourteen days, or until the pulp can be easily removed from the fiber. As the leaves at the bottom will ferment more rapidly than those nearer the top, the bundles are turned every few days, but even where the greatest care is taken some of the leaves will be over-retted and the fiber weakened. The retting process requires a great deal of time and labor, and results in the production of an inferior quality of fiber. It can only be recommended where the purchase of a fiber-extracting machine is an impossibility.

The leaf of sisal hemp is practically the same as that of maguey, and can be cleaned by the same methods. Retting, however, has never been generally practiced in the sisal-producing countries. Previous to the invention of a machine for extracting sisal, this fiber was cleaned in Yucatan by a scraping process. Crude, wooden implements, known as the "pacché" and the "tonkas," were used for this work. With these implements one man could clean only from 6 to 9 pounds of fiber daily.

The first machine used for cleaning sisal, which was the "raspador," was the invention



"PRIETO" FIBER-EXTRACTING MACHINE

of a Franciscan friar. This machine is still used to some extent, and all of the improved, automatic fiber-extracting machines that are used to-day for cleaning sisal and maguey are constructed on the same principle and are but improvements of this old machine.

The raspador consists of a 54-inch wheel which runs in a heavy wooden case. Across the 6-inch face of this wheel, about one foot apart, are placed brass scraping knives. The leaf is inserted through a hole in the case, being held by a clamp, and whips downward as the wheel moves around. A heavy curved block placed underneath is then, by means of a lever, brought to bear on the leaf pressing it against the revolving wheel, which almost instantly crushes and scrapes away the pulp. The leaf is then withdrawn and the other end cleaned in the same manner. Two operators are required for the raspador, one of whom feeds the leaves into the machine while the other operates the lever.

On the sisal plantations the raspador has now been largely superseded by the "Prieto," the "Torroella," and other automatic machines, which clean from 50,000 to 150,000 leaves per day. Where these machines are used, one-half of each day's cutting of leaves is reserved for the following day so that the work of cleaning can commence in the early morning. The leaves are not, however, allowed to accumulate, as after twenty-four hours they begin to harden and are difficult to clean.

In cleaning with the improved automatic machines, the bundles of leaves are first placed on endless carriers, which take them up to the machine platform and drop them on the feed tables. The bundles are then broken and the leaves fed into the grip chains which draw them into the machine. These machines have either two or three scraping wheels, somewhat similar to those of the raspador. On the grip chains the leaf is conveyed to the first scraping wheel which instantly cleans one-half of it. It is then carried on to the second scraping wheel, and in the case of the three-wheel machines subsequently to the third wheel, which cleans the other half in a similar manner, the cleaned fiber being thrown out at the opposite end of the machine. One machinist is required to attend to the machine, one man to feed it, and two boys receive and handle the fiber.

FIBER-EXTRACTING MACHINERY.

The introduction and the use of fiber-extracting machines is the most vital question affecting the maguey industry. Without such machines the cultivation of maguey is confined to limited areas near the seacoast, where the tide water can be utilized for retting the leaves. The fiber thus produced is inferior in quality, and can never rank with sisal in the markets of the world. The introduction of machinery is, in fact, absolutely essential, if any considerable development of the maguey industry is to take place.:

The principal obstacle to the immediate use of the large automatic machines in the Philippine Islands is, that few of our maguey planters are in a position either to purchase these machines or to use them to advantage. Maguey has been planted in small and widely scattered fields, and the facilities for transporting a large number of leaves to any one central point are extremely poor. An improved fiber-extracting machine, to be profitably operated, must have such s supply of leaves. There are a few plantations, or localities, that will soon be in a position to use one of these machines, and the number will undoubtedly increase as the industry develops. What is most urgently needed at the present time, however, is a small machine of limited cost, weight, and cleaning capacity, that can be used on the smaller farms.

The old Mexican raspador has been brought into the Islands, and has been given numerous trials and experiments. The results obtained have not been entirely satisfactory. The quality of the fiber cleaned by the raspador is excellent, but the amount of fiber obtained is hardly sufficient to justify the cost of operating the machine. The use of the raspador in its present condition can not be recommended. A small machine, the "Pioneer," constructed on the same principle as the raspador but with certain improvements, is soon to be introduced into the Philippine Islands. If this machine does the work that it is claimed to do, it should be admirably suited to the present needs of the Philippine maguey planter.

There are a number of different automatic fiber-extracting machines in quite general use in Yucatan. While each of these machines has its partisans, the "Prieto" appears to be in most general use. Ordinarily these machines do not clean up to their full capacity because of the ignorance of the labor used to operate them. The machines used in Yucatan, and the cost of each, are shown in the following table, prepared by the American consul in Merida:

Hemp-cleaning machines in actual use upon the plantations in Yucatan.

Machine.	Number of leaves cleaned in ten hours.	Number of men needed	Actual horsepower.	Cost of machine. Mexican currency*	Cost of machine. United States currency.
Lanaux reformed......	150,000	4	25	$7,000	$8,000
Prieto reformed........	150,000	4	16	8,600	8,689
Torroella reformed	100,000	4	16	7,000	3,003
Villamor reformed.....	100,000	7	16	5,000	2,145
Stephens................	150,000	3	70	(†)	(†)
Solis.....................	9,000	3	9	2,000	858

*The average value of the Mexican peso in 1902, according to the United States mint, was 42.9 cents.
†No more being made.

DRYING AND BALING THE FIBER.

The machine-cleaned maguey fiber of Laoag is washed after it is taken from the machine, and is then dried in the sun. The sisal produced by the Hawaiian Fiber company is washed as it passes through the machine. In Yucatan the fiber is not washed but is taken from the machine, placed upon small trucks, and carried at once to the drying yards. In the yards the fiber is hung over galvanized-wire racks to dry in the sun. If allowed to remain any length of time after cleaning, without exposure to the sun, it will become dark and spotted. If exposed to rain or dew it loses its luster. On one or two of the Yucatan plantations galvanized-iron piping is now used in place of wire with satisfactory results. In Hawaii the wet fiber is taken from the machine and is laid on the ground to dry. While this method of drying gives a fiber that is straighter and, therefore, more easily handled in the baling press, its desirability is to be questioned.

When quite dry the fiber is taken to the baling press in which it should be laid straight without doubling over. On the smaller Yucatan plantations screw presses are used, and on the larger estates hydraulic presses. The weight of the Yucatan bales is variable, ranging from 14 to 16 arrobas, 350 to 400 pounds. The dimensions of a 15-arroba bale are 32 by 25 by 44 inches. Hawaiian sisal is put up in bales weighing 500 pounds, with dimensions of 54 by 30 by 30 inches. The bales are not covered and are tied either with cheap rope or with twisted fiber. Practically all of the Philippine maguey fiber is shipped to Manila and baled on the abacá presses.

YIELD.

The annual yield per acre of maguey fiber will depend upon the number of plants per acre, the number of leaves cut from each plant, the size and weight of these leaves, and the percentage of fiber which they contain. These several factors are so variable, even on a well-organized plantation, that we find the widest variations in the estimates of fiber yield. On two adjoining plantations, where conditions are apparently the same, quite different results may be obtained. The estimates made by authorities and by planters as to the average yield of sisal per acre range from 400 to 1,500 pounds.

The yield of maguey is considerably less than that of sisal. This is due in part tothe difference between the Yucatan and the Philippine plant and fiber; and, also, to the more highly developed system of cultivation of the Yucatan planters. Maguey fiber is finer than sisal, and from a given weight of leaves we get a smaller percentage in weight of fiber than is obtained in Yucatan. With respect to cultivation, the close planting and over-cropping so commonly practiced by our maguey planters result in the production of many small and undeveloped leaves.

In Yucatan it is generally estimated that 82 plants will give an annual yield of 100 pounds of fiber. On this basis, with plants set at 4½ by 12 feet apart, or approximately 800 to the acre, the fiber yield per acre would be 975 pounds. Under average conditions each plant should yield annually from 15 to 30 leaves, giving a total of from 12,000 to 24,000 leaves per acre. The fiber yield is, ordinarily, about 50 pounds per thousand leaves. The fiber yield from 12,000 leaves, at 50 pounds per thousand, is 600 pounds; and from 24,000 leaves, at 50 pounds per thousand, 1,200 pounds, or an average of 900 pounds of fiber per acre.

The following table, showing the results of experiments made by Dr. Charles Richards Dodge in Yucatan, indicates the average weight of leaves and the percent of fiber which they contain:

Lot.	Age.	Weight, 10 leaves.	Fiber yield.
	Years.	*Pounds.*	*Per cent.*
1.....................	5	20	8.27
2.....................	10	10	5.57
3.....................	10	15½	5.92
4.....................	15	8¾	7.67
5.....................	15	14	5.64
6.....................	30	8	6.87
7.....................	32	15	5.88
8.....................	7	21¼	4.45

The average fiber yield of maguey in the Philippine Islands can not be accurately estimated for the reason that we have no uniform system either of planting or of harvesting. Estimates made by Philippine planters as to the average yield of maguey fiber range from 20 to 40 pounds per thousand leaves. The fiber yield from 12,000 leaves at 20 pounds per thousand is 240 pounds; and from 16,000 leaves at 40 pounds per thousand is 640 pounds, or an average of 440 pounds per acre. In experiments made at the Singalong Experiment Station in Manila, the average weight of a single mature leaf of Philippine maguey was found to be 28.1 ounces, and the yield of fiber 2.6 per cent. On this basis 1,000 leaves would yield 45.6 pounds of fiber, or one acre producing 16,000 leaves would give an annual fiber yield of 730 pounds.

VALUE.

On February 23, 1906, the market quotations in Manila for maguey fiber were as follows: No. 1, ₱15; No. 2, ₱12; No 3, ₱9 per picul. On December 29, 1905, a sample of maguey fiber, submitted to the firm of Macleod & Co., in Manila, was reported upon as follows:

The sample of machine-cleaned maguey fiber you left here is very handsome, and I should say of a value equal to sisal, say, 7½ to 7¾ cents, United States currency, f. o. b. New York; or, say, ₱15 in Manila. It might be a little cleaner of wood, or pulp, and the ropy ends are objectionable, but we constantly have the same defects in the Yucatan sisal. This sample is infinitely better than the old salt-water-retted, hand-cleaned Manila maguey. It is not quite as strong as sisal, but finer in texture.

Samples of maguey forwarded to London in October, 1905, were quoted at £30 per ton, the London quotation for sisal on the same date being £37. Machine-cleaned maguey fiber forwarded to fiber brokers in New York City, in 1905, was reported to have approximately the same value as sisal. The usual New York quotation for No. 1, hand-cleaned maguey are from one half to three-fourths of a cent less per pound than for Yucatan sisal.

(Continued on page 144)

CUTCH

UTILISATION OF MANGROVE BARK

Collection and Export of Mangrove Bark

In German and Portuguese East Africa, where mangrove bark has, perhaps, been more systematically worked than elsewhere, the mangroves were at first cut down for timber, and the bark was wasted until its value as a tanning agent was discovered. In the German Protectorate the bark is now stripped from the stems and branches of the living trees, conveyed to convenient centres, broken up, and dried in the sun (or by artificial heat produced usually by the combustion of mangrove timber), and exported.

The industry is under the control of the Forest Department, which insists on the bark being carefully stripped, so that the trees are not destroyed (stripped trees are said to renew their bark in from four to six months), and the authorities also prohibit the export of bark containing less than 45 per cent. of tannin.

In M. Baillaud's experiments much the same plan was followed, and it was found that natives working piece-work could collect about 200 lb. of bark per day, and it was estimated that to place a ton of the bark in Europe would cost fr. 124 c. 50, which seems to be an unnecessarily high figure. It was noticed that if the bark is exposed to the rain after collection, a considerable loss of tannin occurs, so that it is desirable that the drying be conducted under cover when wet weather prevails. In the East Indies the bark is stripped, then dried, and roughly ground and packed in small bales, sometimes under pressure. In this way the cost of transport to Europe is reduced somewhat. Allusion has also been made to the fact that the authorities in German East Africa prohibit the export of bark containing less than 45 per cent. of tannin, and where such regulations are not officially in force, it would be well for exporters to adhere to this rule, since tanning materials are now almost universally bought on their actual content of tannin, and mangrove bark containing less than 45 per cent. of tannin is scarcely saleable, and the inclusion of such material with good bark might lead to losses.

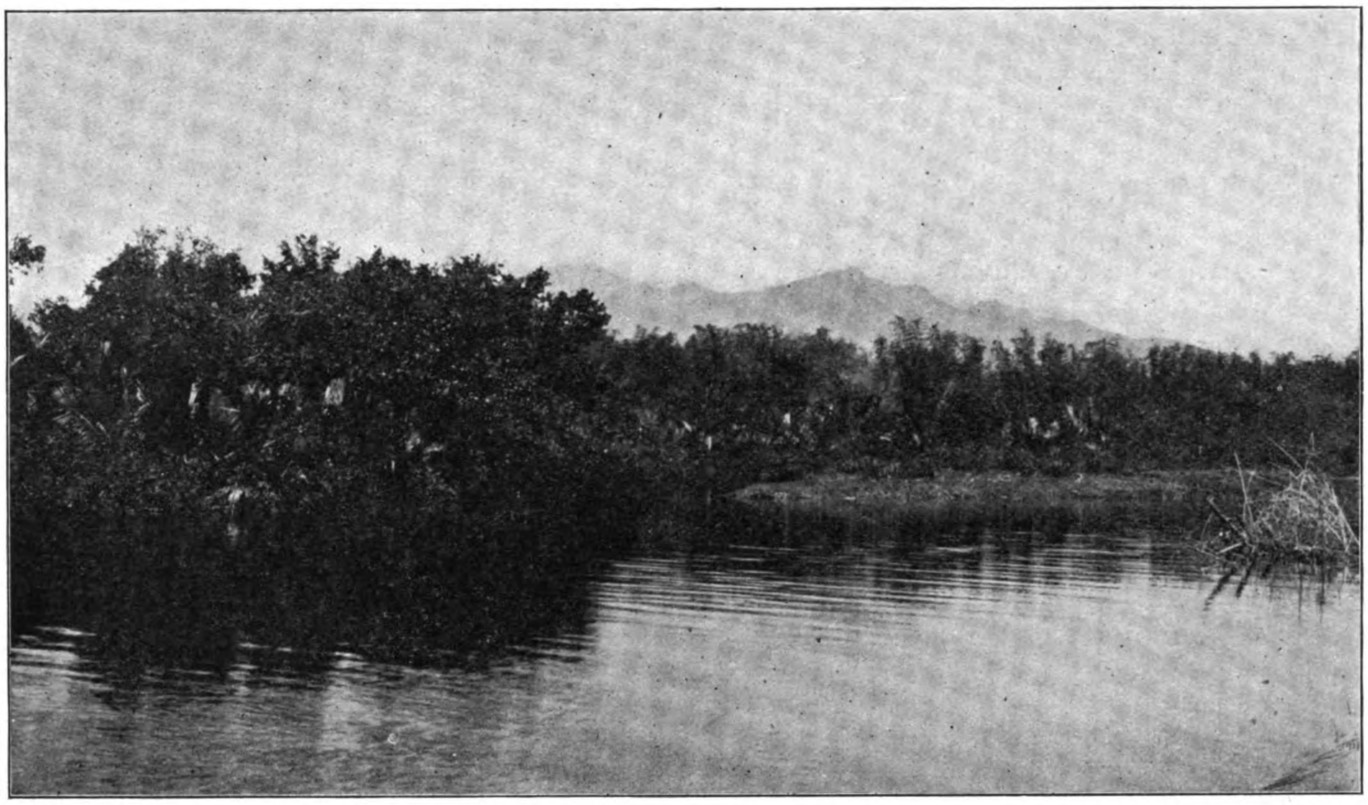
But little attention has as yet been paid to the utilisation of mangrove timber. M. Baillaud states that it is, as would be expected, peculiarly resistant to the action of water, and is therefore suitable for the construction of piles, railway sleepers, and similar articles where hardness and great resistance to the action of water are of importance. It has also been used for street paving in Paris, but apparently the price obtainable for it for this purpose did not prove remunerative.

In the countries where mangrove bark is principally produced at the present time, skilled labor is not usually available, and consequently the manufacture of Mangrove Extract from the bark is difficult if not impossible. Therecan beno doubt, however, that if the extract could be made in these countries much of the poorer bark at present discarded could be utilized, and as the export of extract would mean that only the really useful portion of the bark would be sent to Europe, a great saving in the cost of transport would be effected. It may be worth while, therefore, to give here a short account of the modern process of preparing tanning extracts from mangrove bark and similar products.

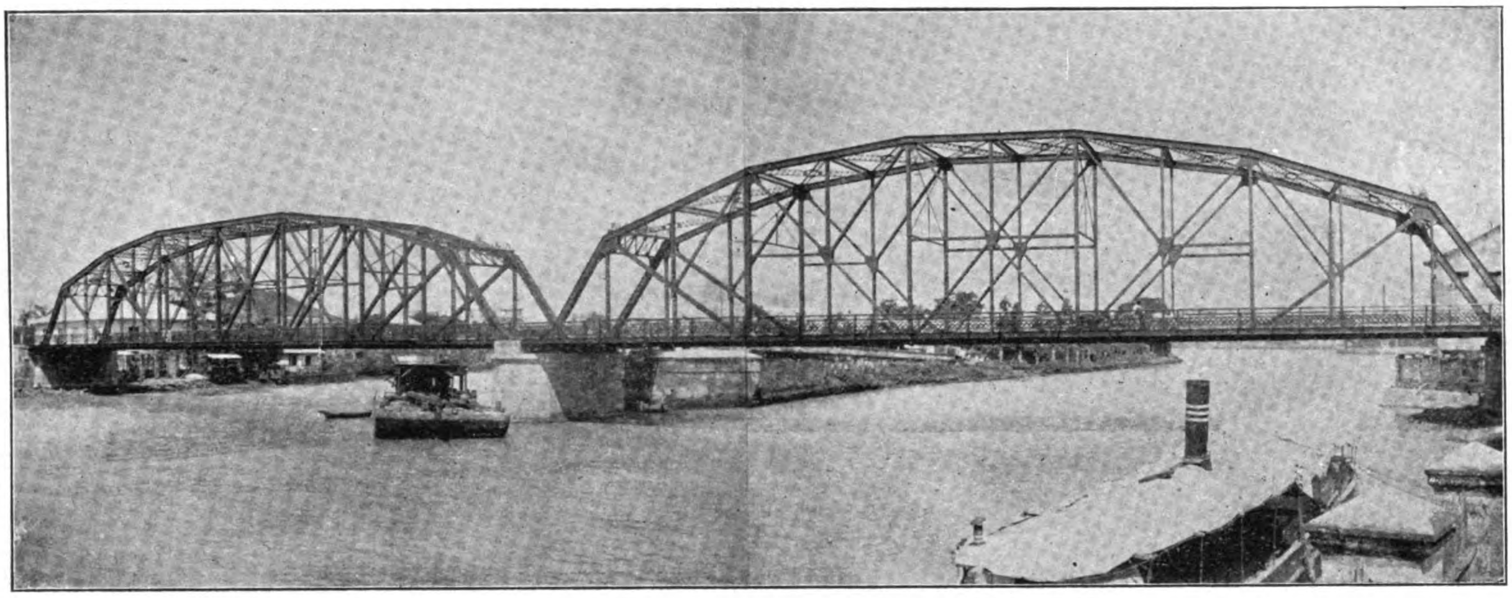
The bark, after being thoroughly air-dried, is ground in a bark mill or disintegrator so as to form a powder, through which water will percolate slowly. This is then packed into "leaches" or extractors, which usually consist of round pine-wood tubs, strengthened by iron hoops and provided with perforated false bottoms, below which the extracting liquor may collect. A series of these "leaches" is employed, a connection by means of a copper or leaden pipe running from the chamber below the false bottom of each to the mouth of the next. Each is also provided with a pipe, whereby steam can be introduced, so that the extracting liquid may be heated to any desired temperature. Water is allowed to flow into the first extractor of the series, which is then heated by means of its steam jet. The warm water percolating downwards through the ground bark, extracts the tannin and other soluble matters, and the liquor so produced gradually accumulates below the false bottom, and as this fills the liquor is forced by the pressure of the water, which is continually supplied to the first extractor, over into the second extractor, and so on throughout the series, until from the last a comparatively strong liquid is obtained. This is then run into a vacuum-evaporator of the Yaryan or similar type, in which it is exposed in thin layers for a short time to a temperature of about 80° C., whereby it is converted into a thick liquid of specific gravity 1.2. Thence it is run into an ordinary vacuum-pan, and evaporated *in vacuo* to a satisfactory consistence. The process thus briefly outlined yields a satisfactory extract (cutch) for dyeing purposes, but one of the greatest objections to the use of mangrove bark or extract for tanning purposes is that it produces a leather having an objectionable red color, and consequently it is necessary in manufacturing extracts for tanning purposes to decolorise the liquor at one stage in the process. This is necessary not only because of the coloring matter naturally present, but also because in the process of manufacture the application of heat to the tannin and extractive matters leads to the production of dark-colored substances by their partial decomposition. The decolorising process is usually carried out with the liquor as it comes from the extractors, and consists in the addition of small quantities of albumen, alum (or aluminum sulphate) or similar material, which forms an insoluble compound with a small portion of the tannin, and as this settles out it carries with it a great part of the objectionable coloring matters. Bleaching agents such as sulphur dioxide or salts yielding this have also been used for the decolorisation of mangrove and other extracts to be employed for tanning purposes, but none of these methods have so far succeeded in completely and permanently eliminating the red color. This is the most serious difficulty in the way of an extension of the use of mangrove bark as a tanning agent, and recently the German Colonial Society has offered a prize of 3,000 marks for a satisfactory and permanent method of decolorisation. The conditions under which this prize is offered are given in *Der Tropenpflanzer*, 1905, pp. 475-6.

The total cost of a small plant arranged on modern lines for the manufacture of mangrove extract, and with a sufficiently large capacity to be remunerative in working, would probably be from £450 to £500.

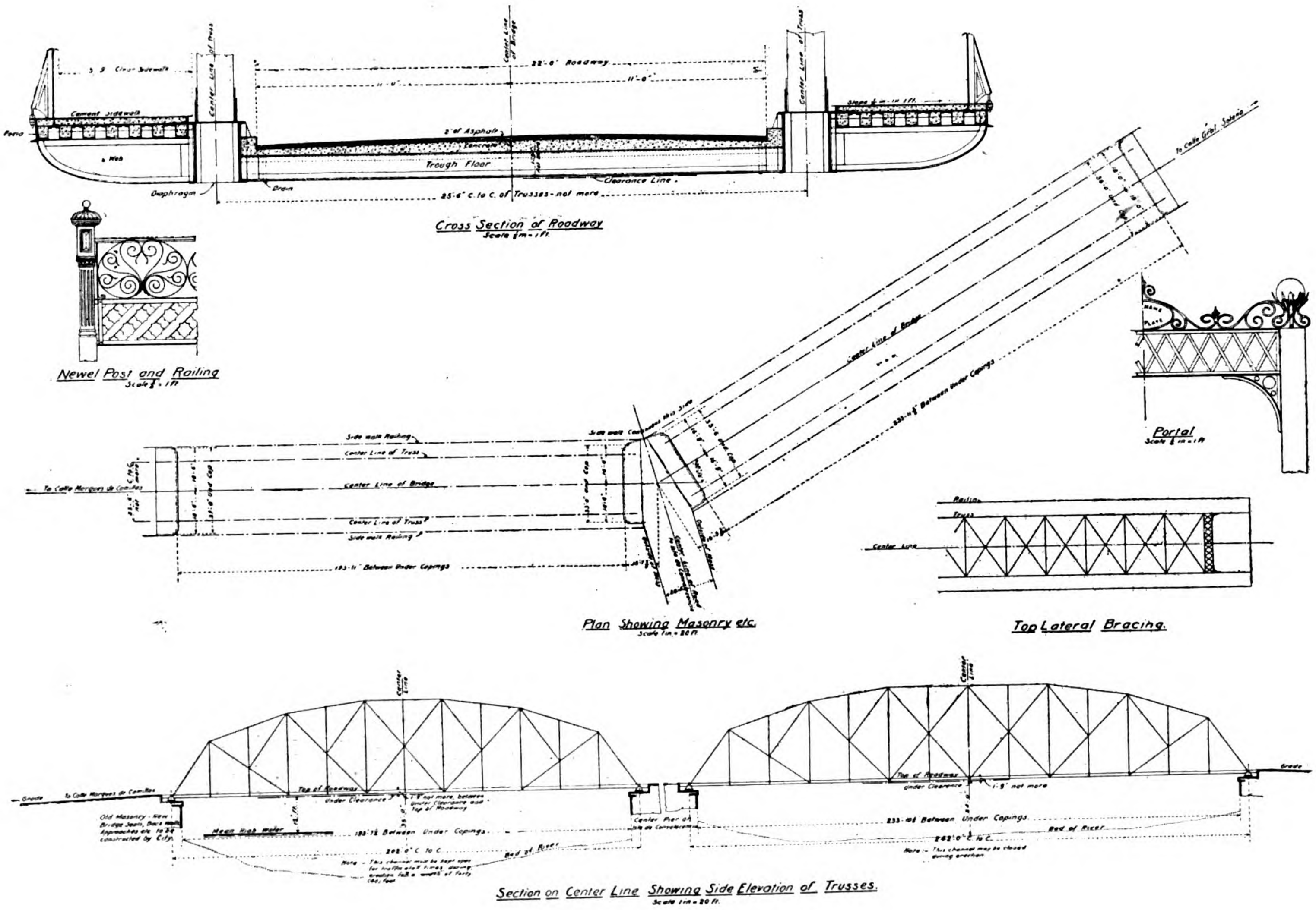
(Continued on page 138.)



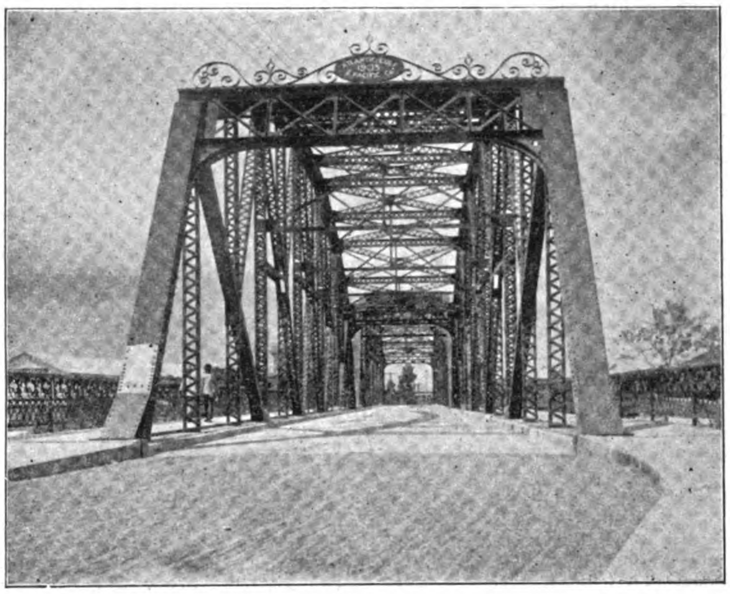
PHILIPPINE MANGROVE SWAMP IN THE LAMAO FOREST PRESERVE



NEW AYALA BRIDGE OVER THE PASIG RIVER, MANILA



PLANS OF AYALA BRIDGE, MANILA



NEW AYALA BRIDGE, MANILA

GOVERNMENT PURCHASE OF JAPANESE RAILWAYS

(Continued from page 118)

THE GAN-ETSU RAILWAY

Capital	2,640,000
Cost of construction	2,584,596
Estimated price of purchase	2,584,596

The total of the estimated prices of purchase reach 248,013,821 *yen*.

In the cases of the Nishinari and Gan-etsu Railways, the prices of purchase are expected to be below the costs of construction. In the above table the costs of construction are provisionally taken as the prices.

The prices of the Gan-etsu and Nishinari Railway will be fixed by carrying out negotiations with those companies. The exact prices of the other railways will be fixed according to the provisions of the Railway Nationalization Law, on the basis of the costs of construction on the date of purchase. But these prices will not be so much different from the estimated prices.

The public loan bonds to compensate the railway companies are to be handed over within a limit of five years. The date of the issuance will be fixed according to the circumstances of the financial world. The Government is going to dispatch engineers to inspect the railways to be purchased.—*Japan Times.*

YOKOHAMA HARBOUR IMPROVEMENTS.

THE SCHEME.

The first meeting of the Yokohama Harbour Improvement Committee was held on the 26th ult. at the official residence of the Minister of Finance. The general outline of the improvement scheme was discussed and a plan and estimates drawn up by the Department of Finance and laid before the committee were approved with some slight modifications. The outline of the improvement scheme as approved by the committee is as follows:—

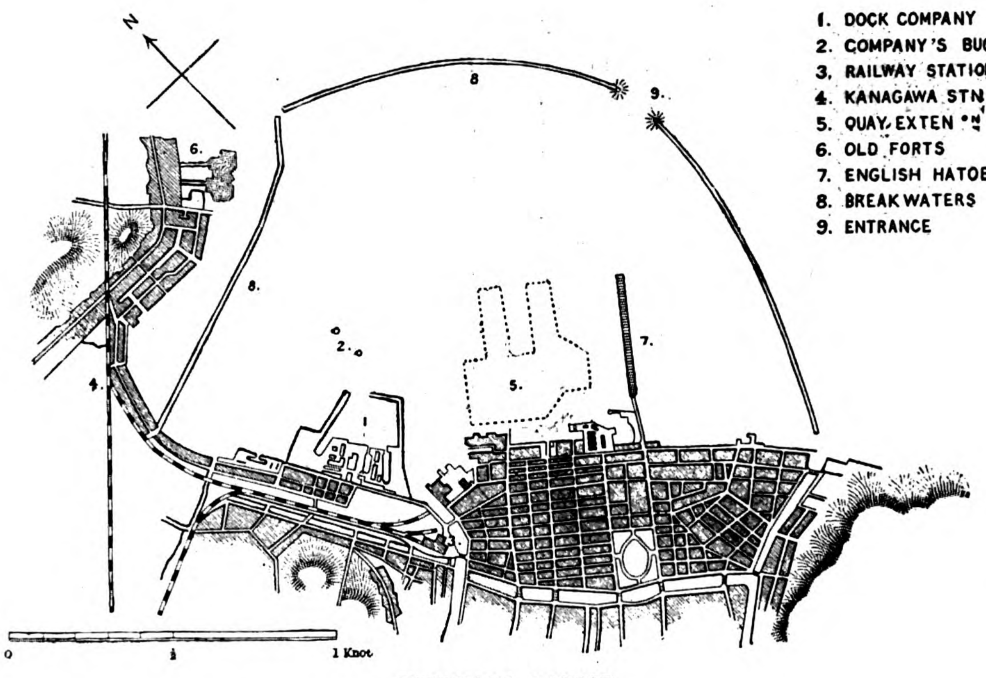
Reclamation Work.—According to the original plan the foreshore in front of the Customs, recovering 68,600 tsubo, is to be reclaimed. Inasmuch as a portion of the work, covering 47,803 tsubo, was accomplished in December last, there remains only 20,797 tsubo to be reclaimed. The height of the reclaimed land is to be 12 ft. 6 in. above the sea-level at ebb tide, and the length is to be 620 ken, the depth of water alongside being above 16 ft. and under 28 ft. The effective space available will measure 506 ken (or 3,036 ft.). The length of the already reclaimed land is 517 ken (or 3,102 ft.), the effective length being 445 ken (or 2,670 ft.) Altogether the total length of the wharves will be 1,137 ken (or 6,822 ft.) and the length available 951 ken (or 5,606 ft.). It will thus provide berths for 13 vessels with an aggregate tonnage of above 54,500 tons, besides providing ample wharves for discharging and loading cargo for junk traffic and embarkation piers for steamship passengers.

Accommodation on Land.—(1) Sheds.—The sheds to be constructed on the reclaimed land are classified into two kinds—iron and wooden sheds. The former are to be built along the wharves, keeping a space of about six ken (30 ft.) from the edge. These are to be used for storing general cargo, and will consist of thirteen divisions, altogether covering 10,710 tsubo. The wooden sheds are intended for the cargo of the junk traffic exclusively, and are therefore less elaborate in structure. All the sheds will be fitted with electric lights, thus facilitating the inspection and storing or discharge of cargo in the night time. (2) Warehouses.—In addition to the sheds, four warehouses, altogether covering 3,097 tsubo, are to be constructed on the reclaimed land. A three-storied building is also to be built, and this building is to be fitted with elevators worked by electric motive-power of two tons capacity. (3) Railways.—Two or three lines of railway are to be constructed between the wharves and the sheds, and the sheds and the warehouses. One of these lines is to be used for discharging and loading the cargo, and another for railway traffic. All the lines are to be so laid as to concentrate at the centre of the reclaimed land, there connecting with the trunk line leading to and from Yokohama railway station. A branch line again is to run across a new railway bridge to the Customs compound to connect with another branch line to be laid in the compound. The whole length of the railway line is to extend for eleven miles. (4) Roads.—In order to facilitate the transportation of goods and travellers, six roads of different dimensions are to be laid on the reclaimed land. The width of the roads is to vary from 12 to 8 ken. In the wider roads footpaths are to be provided for pedestrians. (5) Cranes.—At the end of the eastern wharf a fixed crane of 30 tons capacity is to be provided and also a crane of 20 tons capacity at the end of the western wharf. In front of the sheds altogether 33 movable cranes, varying from 1½ to 5 tons capacity, are to be provided to facilitate the handling of cargo. All the cranes are to be worked by electricity.

Besides the above, water pipes and drains are to be laid down on the reclaimed land and the Customs compound railway and other bridges are to be constructed. The provision of the accommodation on land is to be commenced on the already reclaimed land. The total cost of the work is estimated at 8,180,000 yen, and the scheme is to be accomplished in a period of six years, as already reported.—*Japan Herald.*

OPENING OF THE AYALA BRIDGE, MANILA.

True to their promise the Atlantic, Gulf & Pacific Co., contractors for the erection of the Ayala Bridge over the Pasig River, had their work completed on Occupation Day, August 13th ulto., and have added one more completed public improvement to the city. The specifications and other data on this bridge appeared in the FAR EASTERN REVIEW of August, 1904.



YOKOHAMA HARBOR

THE KAIPING ENTERPRISES

The manager of the Chinese Engineering and Mining Co., Ltd., at Tientsin, recently invited the representatives of the Shanghai journals to visit the mines and works of that Company. The following description of the trip, appearing in the *North China Daily News*, is of such interest that we reproduce it in full.—Ed. F. E. R.

The Chinese Engineering and Mining Co., Ld., which has only been in existence for some five years, is attracting more and more attention in business and shipping circles as the great coal-producing agency of North-China. The Company possesses extensive and almost inexhaustible coal-fields in the Kaiping district of the Province of Chihli, near the Gulf of Pechili. The collieries are centred between the port of Tangku and the Company's own port of Chinwangtao. They are sixty-two miles east by rail from Tangku and seventy-three miles west by rail from Chinwangtao. The Imperial Railways of North-China bring them into close connection with Tientsin, and the Company has a canal of its own, about fifteen miles long. The situation of the collieries is, therefore, all that can be desired from the point of view of speedy and economical transport.

It must not be supposed, however, that the Company confines themselves to the mining of coal only. In addition they are manufacturers of coke, coal tar, bricks, cement, roofing and flooring tiles, water and drain pipes and lime. At the extensive workshops at Tongshan all kinds of iron work, machinery, and repairs for marine and land work are also undertaken, whilst at the collieries their thoroughly-equipped laboratory enables them to give reliable assays, to undertake analytical work, and to report on mining properties in the province of Chihli. Last but not least in importance for the successful working of this great undertaking, the Company possess an efficient fleet of steamers which are engaged chiefly in coal transport and partly in the general shipping and passenger trade in North-China.

That which, however, is of special interest to the general public is that the shortest sea route between Shanghai and Tientsin is viâ Chinwangtao. The unfortunate travellers (and they are many) who have been "stuck on the Bar" for a week or even longer will be able to appreciate the advantage of being able to travel from Shanghai to Peking (875 miles) in something less than seventy-two hours. The whole journey has, indeed, been accomplished in fifty-seven hours. The incoming steamers are timed to connect with the morning mail train which leaves Chinwangtao at eight o'clock. The steamer is generally in good time to catch this train, and it is on record that it has only on one occasion been too late to do so. The journey from Shanghai to Tientsin is independent of the uncertainty and delay due to the Bar attaching to the Tangku route. Visions of long delays, of "days of fuming and fretting," of cherished designs brought to nought and business matters hindered and delayed, all rise up; to be succeeded by a feeling of satisfaction that these are all things of the past which need never vex or trouble us again. Henceforth in comfort, and with the assurance that in all probability we shall reach our destination at the specified time, we may start on our journey to the great northern capital.

Chinwangtao is the natural distributing centre for the north-west part of the province of Chihli, and in the winter season, when the ports of Tangku and Tientsin are ice-bound, the whole import and export trade of the entire province passes through it. In the summer only the steamers of the Chinese Engineering and Mining Co. make use of Chinwangtao. Nevertheless, it has become a formidable rival for the enormous trade which formerly used to be wholly shipped through Tangku and Tientsin, by virtue of the advantages which it possesses over these ports in point of saving of time and handling of cargo. We have already mentioned how speedily and certainly Tientsin may be reached viâ Chinwangtao. By the other route when steamers, even of moderate draft, arrive at Taku Bar, the owners are compelled to lighter them, on account of general scarcity of water on the Bar, and then proceed up river to Tangku and Tientsin. This makes the length of the voyage viâ Taku to Tientsin to be most uncertain, a week or more not infrequently being required to accomplish it.

The land in the vicinity of the port of Chinwangtao belongs to the Company and a breakwater and pier have been erected. The berthing accommodation is sufficient for half-a-dozen good-sized vessels, with a number of smaller ones in addition. The pier has also berths for two ordinary coasting steamers. A branch line of railway, connecting with the main line of the Imperial Railways of North China running from Peking to Newchwang, has also been laid down. Tangko station being three or four miles distant from the harbour works. This branch line leads down to the steamers' berths at the breakwater and pier and connects by a loop line with the Company's godowns and coal yards. By these arrangements passengers are enabled to step from the ship into the railway car.

The above-mentioned advantages and facilities afforded by the route to Tientsin viâ Chinwangtao, not being as well known as they ought to be, induced the Chinese Engineering and Mining Co. to make arrangements for a special trip for representatives of the Shanghai Press. The Company's fleet is not a large one but just about a year ago they added a very fine steamer, the Kaiping, one of the largest on the coast of China. This magnificent vessel is commanded by Capt. Macfarlane, late of the Hsiping, who brought her out from home, and who, in conjunction with Mr. Joseph Blackett, the well-known naval architect in London and superintendent engineer for the owners, supervised the construction of the vessel. It was on this ship that the representatives of the Press travelled on their tour of inspection, and a few particulars in reference to her dimensions and accommodation may prove of interest to those who will probably travel on her in the near future. That many will do so, especially during the winter season, there can be no doubt, her accommodation for both foreign and native passengers being so excellent that she is certain to be well patronized. Her length over all is 312 feet, gross tonnage, 2,546, net tonnage 1,605, and she carries a load of 3,543 tons on a draught of 19 feet 4 inches, steaming at the rate of 13 knots per hour. Her indicated horse-power is 2,700. If not particularly beautiful in appearance, she yet impresses one with the idea of solidity and comfort. Her engines consist of a set of triple-expansion engines, steam being supplied by two large single-ended boilers, working at 180 lbs. pressure. Six powerful steam winches are fitted, there is steam steering-gear amidships, hand screw gear aft, patent direct steam windlass, large donkey boiler, strong derrick gear, and an electric light installation, including lamps in the hold and on deck to enable goods to be loaded and discharged during the night. The boilers are fitted with Howden's system of forced draught, and See's patent ash ejectors are used. These ejectors are similar to those being fitted to the new express Cunarder, the Mauritania, now in course of construction by the builders of the Kaiping.

In the central deck-house forward is the captain's saloon, and just aft of this is the ladies' lounge and the entrance staircase of the saloon, one noticeable feature of which is its height—eight feet from floor to ceiling. All the decks, indeed, are of unusual height and the alleyways are lofty and airy. There are nine state-rooms in all, accommodating twenty passengers, each one being fitted with electric fan and light. The excellently fitted lavatories and bathrooms adjoining leave nothing to be desired. There is also accommodation for thirty first-class and the same number of second-class Chinese passengers. On the bridge deck is a commodious wheel-house; on this deck there is also a Kelvin's compass with the latest modern improvements, probably the only one of its kind on the coast. There are four large life-boats and aft are gig and pinnace.

It was, as we have said, to this well-equipped and comfortable steamer that the small launch of the same name as the vessel brought the little company of representatives of the Press on the evening of the 6th instant. She lay at the Company's wharf distant about three miles from Shanghai, and on arrival Mr. Frischling, the Company's Marine Superintendent, was soon at hand to impart any information required. At 5 a. m. the next day the vessel started and experiencing delightful weather the whole way we arrived at Chinwangtao at 5.30 a.m. on the 9th, thus having made the journey of 635 miles in 48½ hours. The same journey was accomplished last December in 48 hours 15 minutes, which is at the rate of about 13.2 knots per hour. The extra quarter-of-an-hour required for the present voyage was due to the hindrance occasioned by the new regulations of the Huangpu Conservancy Board; at least this is the explanation given by the captain. Chinwangtao has very appropriately been called "the open door to Peking," the distance by sea from Shanghai to the capital being about forty miles less than the route viâ Tangku, to say nothing of the certainty of being able to arrive at the specified time by the shorter way. Holiday-makers who are seeking rest and recuperation at Peitaiho, the delightful summer resort of North China, will find it economical and very much more expeditious to go there viâ Chinwangtao rather than by the former route viâ Tientsin. The Peitaiho station is only about sixteen miles from Chinwangtao. Chinwangtao itself (to which the first vessel, the Peiping, went in the winter of 1896, before there was any pier or breakwater), as a seaside resort or sanatorium has few places to equal it and it is certain to become a favorite summer resort now that such quick and easy access to it can be had. A beautiful sandy beach, dry and bracing climate and a magnificent view, are some of the principal attractions which are to be found there. Arrangements, too, have recently been made between the Chinese Engineering and Mining Company and the Hamburg-America line for a joint tariff with interchangeable tickets for use on the steamers of the two companies between Shanghai and Tientsin. It will be possible, therefore, for passengers to make the fast journey viâ Chinwangtao, and return for variation by way of Chefoo and Tsingtao or vice versa. Another change which will no doubt be appreciated is the quotation of the fares in dollars instead of in taels as heretofore.

The day before our arrival at Chinwangtao a French fleet of three gunboats and four torpedo boats had arrived and French soldiers were in evidence everywhere. The barracks accommodating the soldiers of four or five different nationalities were visible from the ship and the "Admiralty Pier," built as a temporary structure by the British in 1900 to land troops and stores, but afterwards made into a permanent one at the expense of the various nations concerned, is a conspicuous object in the distance, whilst here and there substantial-looking buildings, the residences of those connected with the Company, are seen. The French admiral was traveling to Tientsin on the same train and a body of Chinese soldiers was drawn up to salute him at Tangho. A diminutive Japanese soldier, taking keen notice of everything that was happening, was very much in evidence,

and we were informed that one such was present on the arrival and departure of every train, but for what purpose did not appear to be very clear to anyone.

After a very pleasant run of 162 miles in the luxuriously-fitted train, we arrived at Tientsin soon after 3 p. m. The first half of the journey as far as Tongshan, where the Company's coal mines are situated, is through pleasant hilly country, one feature of which is the number of walnut trees, but after Tongshan is passed the country is very flat and uninteresting—quite desert in fact. The soil is so salt and so frequently under water that no cultivation of it is possible. It is, therefore, with a feeling of relief that the city of Tientsin is seen in the distance. Arriving there a short carriage drive through the French and English Concessions brought us to the Astor House. In the evening we were entertained to dinner by Major Nathan, brother of Sir Matthew Nathan, Governor of Hongkong, and General Manager and Agent of the Company. It was under Major Nathan's hospitable roof that we had an opportunity of meeting our confrères in the journalistic world who live in Tientsin.

It had been arranged to delay the departure of the Kaiping for one day, in order to permit any of the party who felt disposed to do so to go to Peking. The journey of some eighty miles was made in a little over three hours. The country was much more picturesque and interesting than that between Tientsin and Tongshan. The Grand Hotel des Wagons-Lits at Peking, just inside the Chien Men and close to the railway station, leaves nothing to be desired in the way of accommodation, and one would willingly have spent a much longer time in visiting the famous places in the great northern capital. But at eight o'clock in the morning, punctually (and in China, too) we were speeding on our way to Tongshan, distant about 160 miles. The short stay at Tientsin *en route* enabled us to make the acquaintance of Mr. Foley, the genial General Manager of the railway, who, with Major Nathan and other friends, was on the platform awaiting the arrival of the train.

Tongshan, where are to be found the collieries of the Chinese Engineering and Mining Co., is situated at about an equal distance between Chinwangtao and Tientsin. A descent into these coal mines, among the largest in the world, if not exactly a pleasant experience, is certainly one of a most interesting nature. And the unsparing efforts put forth by Mr. N. Paquet, the Engineer-in-Chief, Mr. Knauer, the Engineer-in-Charge, and Mr. Ley, Mr. Paquet's Secretary, left nothing to be desired. The mines have been worked by the Chinese for centuries, but only superficially, as they lacked the proper machinery and requisites for developing them. The late Viceroy Li Hung-chang, in 1878, took great interest in these mines, but it was not until 1901, just after the Boxer troubles, when the colliery passed into the possession of the Chinese Engineering Mining Co., that any steps adequate to the requirements of such an important enterprise were taken. Now they have developed to such an extent that the output of coal per day is fully 3,000 tons and more than 3,500 men are employed in the mines at Tongshan, working in three shifts of eight hours each. In addition to the principal mine at Tongshan, there is another at Linsi, distant about thirteen miles, the nearest railway station being Kuyeh. About 2,000 men are employed here. This mine promises in the not very distant future to become the most important of all, the mining operations being easier than at Tongshan. At the Northwest shaft about one mile from Tongshan, 600 men are employed. The coal produced by the Company is extensively used over the whole of the coast of China, and is quickly supplanting the native product used in the interior on account of cheapness. It is also used on all the railways of North China. It seems, moreover, that the demand for it is greater than the supply.

The collieries present a scene of great activity and bustle and everywhere evidence is seen of a vast and growing concern. There are about 750 men at work in the various workshops above ground. These workshops have been reorganized and extended. Modern and efficient plant for turning out all kinds of iron work, machinery and repairs, in an expeditious and workmanlike manner have been fitted. The workshops are under the constant supervision of skilled and experienced European engineers. There is a fitting shop, a boiler-maker's shop, a blacksmith's shop, and a foundry. The Engineer-in-Chief is now engaged in the fixing of a huge electric plant, 21 boilers of 30 tons each (nine at Tongshan and twelve at Linsi) for power and lighting purposes. Four of these boilers have already arrived. The tour of these workshops under the guidance of the Engineer-in-Chief proved to be both pleasant and instructive. The presence of this great colliery has brought a good deal of money to the people, and the little village of Tong-shan, through which we passed from the train *en route* to the coal mines in Peking mule carts, had quite a prosperous appearance. The miners all seemed to be enjoying the luscious melons, to which, perhaps, a peculiarly acceptable flavour had been imparted by their grimy fingers.

The mail train from Peking had had two extra cars attached to provide sleeping accommodation for the party, as it was feared that the resources of the foreign staff of the Company would not be equal to the occasion. Such fears, however, were groundless, as the whole of the party were speedily taken possession of and hospitably entertained.

We were awakened the day after our arrival by the colliery steam whistle at five o'clock. This whistle is used to call the miners, many of whom work in their fields distance from the mine, to get ready some to descend at six o'clock. It was not until considerably after nine o'clock, however, that we were actually on our way to make the descent.

Having divested ourselves of our ordinary garments, we proceeded to don the suits provided for us of which, perhaps, from an æsthetic point of view, the less said the better. They were certainly unsightly and not exactly good fits, but they were just as certainly what were requisite for the work to be done. Thus attired we entered the cage and commenced the descent of No. 1 shaft which is 600 feet deep. It usually occupies but a very few seconds to reach the bottom, but on this occasion, by reason of our inexperience, the speed was considerately slackened. In due time we reached our destination, and found ourselves in a world altogether unfamiliar to us. It was gratifying to learn that no accident of any very great importance had ever taken place in the mine. Lives had been lost, it is true, and men had been injured from time to time, but in most cases these were due to the characteristic indifference of the Chinese miners and their carelessness in neglecting to avail themselves of the safeguards provided for them. On one occasion a miner in the cage, not making use of the safety belt, fell a distance of six hundred feet and was dashed to pieces. Miners have lost their lives also through their failure to make use of the "props" provided to hinder the coal from falling and crushing them. But, as we have said, the mine has been exceptionally free from serious accidents. There are several Belgian miners employed in the mine, from whom we learned that as compared with those in Belgium there was more water in this one. Certainly one is impressed with the great quantity of water that is being ceaselessly brought to the surface by the huge pumps, and wonders whether the quantity is not greater than that found in many mines in other parts of the world. The electric installation which is to be completed in October next will facilitate a great deal the pumping of water from the mine, and so remove that which is at present a hindrance to the work.

The Tongshan mine is about two miles long from east to west and extends, perhaps, one thousand feet north. There are thirteen seams of coal, which, if one may judge from the No. 9. seam which was visited, are very rich. We understand that the galleries are wider than is usually the case in Belgian mines, which gives greater freedom to the miners and enables them to carry on their work with less danger than would otherwise be the case. We found, with here and there an exception, that there was an abundance of fresh air in the mine and little or no inconvenience was caused by the high temperature. The scene was a weird one as we slowly wended our way through the seemingly interminable galleries, under the leadership of an experienced Welsh miner. Through slush, with the water trickling down the sides of the mine or dripping from the roof, which in some places was so low as to make it impossible to walk in an upright position, we plodded on, carrying our Davy lamps. Every now and then we had to keep close to the sides as the rattling noise warned us that a mule dragging three or four coal cars was approaching. The Chinese miners presented a weird sight as they gradually came in view emerging from the gloom, crouching in the cars. There are about 250 mules underground where they remain until sickness necessitates their being brought to the surface. There are in addition, another 200 mules employed outside the mine. A visit to the underground stables showed that every care was taken of these useful animals. One very interesting object in the No. 3 level visited by us was the main pump (Moore's patent) which pumps the water brought up from No. 6 level, which is 500 feet deeper and conveys it to the surface of the mine. It was generally agreed, after about one hour had been spent in the mine, that a return to the outer world was desirable and the first glimpse of the light of day as we gradually neared the mouth of the pit was a very welcome sight. Begrimed and perspiring we stepped from the cage, well satisfied that we had ventured down the mine, but still more satisfied that our experience was a thing of the past.

We have already said that coal mining is only one branch of the Company's great enterprise, and it is to be regretted that there was not sufficient time to look more closely into what is being done in other directions. Between forty and fifty Europeans are employed at Tongshan. There is a Club and a race course, as well as other indications of advancing civilization and progress, and as the mine develops and the number of foreigners increases, the place promises in the near future to become an important one. The surrounding country is pretty enough, although, of course, the dusty and grimy appearance inseparable from coal-mining districts is to be found here also in the immediate vicinity of the mine.

Both at Tongshan and at Chinwangtao ovens have been installed for the production of coke, which, as the coal is bituminous, is of very good quality. The brickfields are capable of turning out about one million square firebricks per month, the fireclay obtained in the district being of very good quality. There are also large cement works, the raw products used in its manufacture being found in unlimited quantities in the vicinity of the works. A private telegraph service has been established between Tientsin and Chinwangtao, and arrangements have been made with the Chinese Telegraph Company of Tientsin to transmit messages received over the Company's lines for the special benefit of travellers who pass through Chinwangtao.

It affords us great pleasure, in conclusion, to acknowledge the kind courtesy and consideration we received from all connected with the Company with whom we were brought into contact. No efforts were spared to make the trip a delightful and enjoyable one, and public recognition of the fact is only what is due to the Company. The reception accorded the representatives on their return, when they gave expression to these feelings, must have been gratifying to those present who had made the arrangements for the trip and through whose forethought and efforts it was so successfully carried out.

IWAHIG PENAL COLONY

There have been set aside as a penal reservation 22,000 acres of land in the Province of Palawan, extending from the harbor of Puerto Princesa up the stream known as Iwahig which cuts the reservation in two. The land is rich, fertile, and very little of it has been cleared although a few scattered settlements, title to which has been taken over by the Government, have been inhabited for some years. The land grows good quality of corn, rice, tobacco, sugar, hemp, copra and cacao. Within a reasonable distance there are extensive forests of fine woods. The best bejuco of the Islands comes from Palawan and is now shipped to Singapore, thence to Hongkong and thence to Manila.

In November, 1904, a plan for a penal colony was gotten under way and a gang of prisoners sent down to begin construction of barracks. There are now barracks capable of holding 650 men, superintendent's house, store house, prison, police house, hospital, etc. The construction is of temporary material, bamboo, etc. The number of prisoners now in the settlement is 500, mostly able-bodied men. There are no women there. Twenty-five additional prisoners go down on each boat. Three hundred and fifty acres are now under cultivation. The colony is by no means self supporting. Supplies of all sorts are still sent in great quantities.

Captain John R. White of the Constabulary has been selected to take charge of the Penal Colony and to place it upon a new, and it is hoped more progressive, basis.

The general plan of Commissioner Forbes is to divide the reservation into three zones, one of which will be occupied by men in barracks who are to be under fairly close supervision although unguarded; the second to be occupied by men in homes who work for the benefit of the Government and who are allowed to have their families; and the third to be known as the free zone where prisoners who have obtained their freedom conditional upon living for a period of years in the settlement or who have obtained their freedom and wish to remain there, may be alloted sites on which to settle.

The general plan is to compel each prisoner in the settlement to do a given amount of work and by doing this work to earn his way through successive stages, as boys do at school passing from class to class, in each stage having wider privileges, more freedom and better opportunity By this means it is believed that a continual incentive for work will be supplied. The minimum of labor required must be performed under penalty of failure to receive promotion, and for continued failure, of returning to Bilibid Prison. Confinement in the settlement prison will be another penalty for local offenses. By this means it is hoped that an intelligent education can be given the prisoners in agricultural employment and an opportunity given them to improve their position and attain their freedom. The plan gives a sort of self-government to the prisoners by which they will have their own council and their officers and select their own policemen who will be charged with the maintenance of order and seeing that their fellows observe the rules and regulations of the settlement. This plan is already partially in effect and it is a source of great pride to the members of the colony to be selected as members of the police force and allowed to wear the insignia of that office.

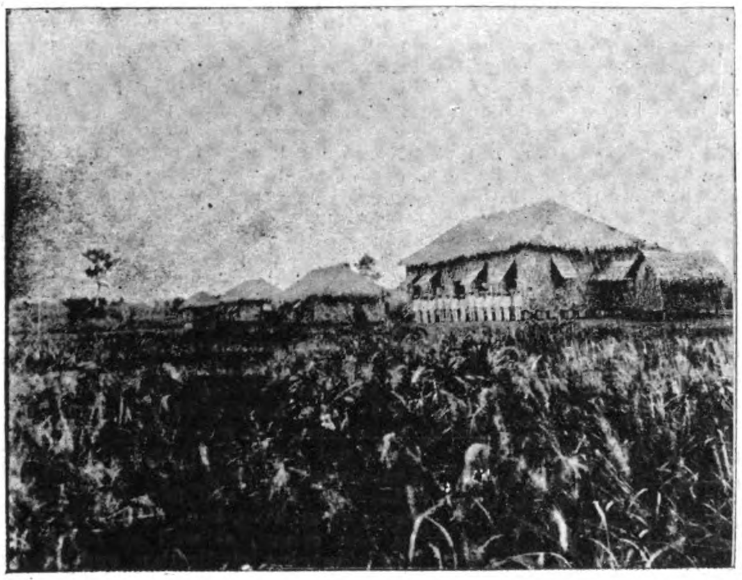
The plan will be to plant the natural products of the soil and raise them for the maintenance of the settlement and an effort will be made to make it self-supporting. The settlement can grow a good quality of corn, rice, hemp, tobacco, cacao, and cocoanuts and it is expected to plant these in sufficient quantities to support all of the prisoners and the settlers and to yield a sufficient return to pay for the necessary improvements which will be made from time to time.

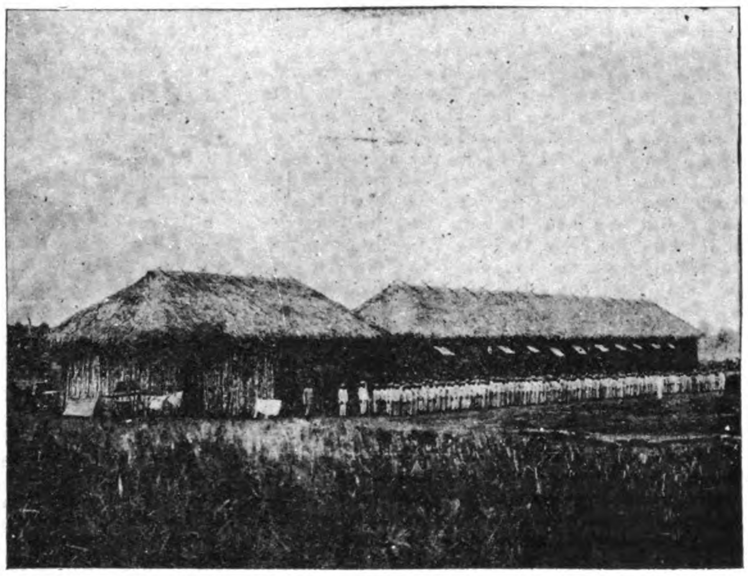
It is expected that prisoners and their families of the home zone and free zone will each have a five acre lot of land which they will be required to cultivate, and in these zones the settlement will take the products of the different farms and give a reasonable price to the settlers so that they can have the advantage of the central bodega and means of transportation.

It is also expected to put these prisoners of the home zone on a co-operative basis so that a share of what they produce will be paid to them in cash, and thus an additional incentive be given them to work.

It is also expected that as the production of the settlement increases, modern machinery will be installed and an effort made to use the labor therein to the best advantage, as would be done in some first-rate industry.

There are now confined in Bilibid 3,500 prisoners which is a reduction of one-half over what there were about two years ago and which has relieved the great congestion of that place. Half of this reduction has been made by the transfer of prisoners to the settlement and there are now 500 of them there and over a hundred at work on public works at Puerto Princesa. It is expected to send 2,000 prisoners to the settlement and it is believed that a considerable portion of long-term prisoners, who are not criminally incorrigible, will have an opportunity to work out their sentences in this way. This plan has the double advantage of being healthy and advantageous for the prisoners and will eliminate a part of the criticism which has been leveled, with more or less reason, by merchants against the competition which the prisoners create by reason of their manufacturing now carried on in Bilibid. It is the desire of the administration to reduce this feature to the lowest possible limit, and yet it is unhealthy for men to be confined without any useful employment and the results are so advantageous to the prisoner in teaching them some useful trade, and, moreover, the expense to the community is so great in maintaining the prison that it will be necessary to maintain, in a small way, the manufacture of certain articles which will serve two purposes: namely, that of educating the prisoners and of repaying part of the expenses of the prison.





IWAHIG PENAL COLONY

CUTCH

(Continued from page 133)

Quality of Leather Produced by Mangrove Bark.

Reference has already been made to the dark-red color of the leather tanned by mangrove bark or extract, and to the fact that this color depreciates its value. Apart from this defect, mangrove tanned leather when properly made seems to be fair quality and suitable for shoe leather and similar purposes. On this point Professor Proctor, of the Leather Industries Laboratories of the Leeds University, says that "mangrove bark is now largely used in conjunction with pine, oak and mimosa barks, and that extract prepared from *Ceriops Candolleana* makes a good but dark-red leather;" and Professor Körner, of the Freiberg Tanning School, as the result of his experiments on the value of mangrove extract as a tanning agent, states that "it yields a soft and pliant, workable leather, which, however, possesses an objectionable red color, which can only be modified sufficiently for commercial purposes by using it in conjunction with myrobalans, valonia, sumach or similar light-colored tanning materials.—*Bulletin of the Imperial Institute.*

CHINKIANG INDUSTRIES

The commissioner of customs at Chinkiang, in his report on the return of trade for that port for the year 1905, says:

"The year's trade, measured by its net value, falls but a trifle short of its predecessor, and may be considered one of average prosperity. Commerce as a whole was moderately profitable, though the Cantonese merchants complain of a bad year, largely owing to stringency of money through overspeculation in the south. Crops were fairly good, and agriculturists were enabled to realize a sound profit by the removal of the restriction on the export of grain.

"Work was begun on the new Shanghai-Nanking railway in the early spring, and a large number of coolies were brought down from Shantung as laborers. On September 1, 1905, the first sod of a tunnel 1,700 feet long, under Pao-kai-shan, a hill on the border of the British concesssion, was cut by the Chinkiang Taotai, in the presence of the principal local officials and members of the foreign community, and considerable progress has been made in the construction of the line.

"A scheme for bunding and reclaiming the large area of silted foreshore of the river was made public early in the year, with the approval of the viceroy, the levy of wharfage dues being an essential element of the proposal.

"In October electric light was introduced into the extensive Chinese suburb between the British concession and the city. The credit of its introduction is due to the enterprise of a remarkable individual, Mr. Chang Chieng, a native of Tungchow, in this district, who having, when in humble circumstances, won the highest and most coveted literary rank of chuangyuan, or optimus, in the palace examination, has employed the influence so acquired in promoting the manufacturing industries of his native town and vicinity. He is an ardent supporter of the principle that China can and should manufacture for herself the fabrics now imported in such enormous quantities from abroad, and, having no capital of his own, he has had the ability to convince men of high position and wealth to entrust him with means of putting his views into practice. The extent of his enterprise may be judged from what follows:

MANY MODERN FACTORIES.

"At Tang-chia cha, a suburb of Tungchow, with water communication to the Yangtse, there are already established and at work a cotton mill of over 40,000 spindles for fine yarn, with English machinery, employing 2,500 hands, and capable of turning out 30,000 bales annually, for which a good market is said to be found locally. In the other mills there is machinery of German, American, Japanese, and some of Chinese make. There is a mill for extracting oil from cotton seed, the waste product of which also finds a good market as a fertilizer; a flour mill with a capacity of 7,500,000 pounds annually; a dyeing factory for cotton and silk fabrics; a factory for spinning and weaving silk; a canning factory for meat, fish, etc., and what will eventually be a dockyard for building steam launches and their machinery, but has at present only the plant for boiler making. Just outside of Tungchow there is a printing establishment for books and maps. In the vicinity is also a soap factory. On the island of Tsungming, on the Yangtse, under the same management, there is a cotton mill and a large brick factory, the latter at present employed in supplying bricks for the numerous buildings still in course of erection.

In addition to these 11 establishments 19 more are projected or in course of erection; among them a cotton-weaving factory is already sufficiently advanced to admit of the instruction of mill hands who will later carry on the work. All the factories are well built, worked by steam power, and lighted by electricity. Mr. Chang has also an interest in the Chinkiang flour mill, which produces a brown flour pronounced by a foreign analyst pure and nutritious, and which, as I have found, makes excellent bread. The produce of the Tungchow mill is of like quality. Old-fashioned millstones, turned by steam power, are now used, but steel rollers are to be introduced. I am informed by a Chinese gentleman, who is well acquainted with all the above enterprise, that their textile fabrics are not equal to those of European, American, or of Japanese mills, but that they are cheap and find a ready market among the Chinese. It is expected that the quality of the manufactures will improve with the growth of experience and skill.

"The waterways, which spread net-like over the surrounding country, are for the most part navigable by small launches, of which Mr. Chang has half a dozen, and he has already done something to facilitate their movements by the building of a fine quay of some 1,500 feet at Tangchiacha. He has also constructed a bridge there 200 feet long over the Liho; is making lock gates on the creek between Tangchiacha and the Yangtse, otherwise rendered impassable by difference of level, and he has acquired a dredger wherewith to deepen the numerous shallows in the canals. He will shortly have two small steamers running on the Yangtse between Tungchow and Nanking."

YALU VALLEY TIMBER DEVELOPMENT

Consul-General J. E. Jones, of Dalny, writes as follows concerning the concession given in the treaty between Japan and China for the formation of the Japan-China Timber Company for exploitation of timber in the Yalu Valley:

"A short time ago two Japanese timber experts visited the locality and made a careful estimate of the available supply and probable cost of handling. One of the details of the enterprise is the rafting of the timber, and their estimate of the probable cost of a raft of 500 trees is $183 for labor of felling trees and making raft, $76 for sustenance of laborers employed, $13.50 for 3 raftmen, $40 for 10 carriers, $24.50 for sustenance of raftment and carriers, $30 for hire of 1 ox, $73 as recompense to contractors 20 per cent of expenses. The selling price of raft is figured at $660, leaving a net profit of $220 or a total profit on 3,000 rafts per annum of $660,000. The business expenses are set down at $54,400 and establishment expenses at $159,000. This report is submitted as bearing upon the general idea that, so far as possible, it is the purpose of both Japan and China to control the enterprises in Manchuria, to the exclusion of the foreigner."

CHINESE RAILWAYS

NEW FUKIEN LINE.

Harry L. Paddock, the new consul at Amoy, makes his first report, stating that the long-projected Fukien Railway is at last becoming an assured fact. He writes:

This Fukien Railway will penetrate both the northern and southern parts of this province and will extend about 1,000 miles. Land is being acquired at various points along the proposed route and work will be commenced here. The Amoy terminus will be located on the mainland known as Sung Su, which faces the city and is about 1½ miles distant and about 1 mile from the international settlement of Kulangsu. This line will be built to Changchew, whence a southern line will be built through Chao Chow and on until it connects with the Kuang Tung Railway; from Changchew a norther line will be built through Chuan Chew and Hsing Hua to Foochow. From Foochow the road will further be extended to Yen-ping, whence one branch will be built to Kien-ning and another to Shao-wu, in order to connect with the Chekiang and Kiangsi railways, respectively.

This is the present proposed line of railway and indications would go to show that immediate steps are to be taken to consummate the plan. At least the line between Amoy and Changchew has been decided upon and work is to commence immediately under Mr. Chen, commissioner of railroads for this Province. The rivalry between France and Japan for the control of the new railroad is decidedly marked, and the rolling stock and railroad supplies will no doubt be furnished either by French or Japanese firms. There is an opening for American railroad engineers in this Province, provided prompt action is taken, but at present French control is decidedly marked. Whether American supplies can be introduced at this late date or not is a matter more or less problematical so far as this particular line is concerned, but it is at least worth trying.

Improvement in the methods of travel is one of the results of the present progressive movements in China, and railways are being projected in many quarters. At present the only engineers in this port are either Japanese or French, who are on the ground and consequently in a position to control the railway movement. If American firms intend to avail themselves of this opening market, it would be advisable to have some energetic representatives on the field at an early date.

SOUTH MANCHURIAN LINE.

Plans to guarantee construction.

Consul-General John E. Jones, of Dalny, reports that during the consideration of the subject of financing the South Manchurian Railway a proposition was made for the Japanese Government to guarantee the interest upon the investment for a period ranging from three to five years.

This, it was urged by the supporters of the measure, would be an additional incentive to investors and expedite improvement of the road. It is stated in Tokyo now that the Government will not guarantee any interest, and that the method adopted will be this: A valuation will be made of the line as at present constructed, as well as the appurtenances thereto and the mines along the road. The sum total of these will represent the Government's interest in the road. Following this, a committee of railway experts will carefully estimate the amount necessary for improvements, which will include the new construction incident to a change of gauge, additional rolling stock, depots, etc., and for this amount the general public both of Japan and China, as well as the Governments of each, will be asked to subscribe. This will represent the general capital of the road.

It is then proposed to have the auditing committee go over the accounts of the road at stated intervals and whatever net profits remain will be applied to paying a 6 per cent interest on the general capital only. The Government stands aside, in other words, until the shareholders are paid, and then if there is any surplus it participates in the remainder. Thus it appears that shareholders in the new South Manchurian Railway will be "preferential shareholders" and that they will be virtually guaranteed a 6 per cent return.

KEYSTONE DRILLER CO.

We invite the attention of our Eastern engineering firms to the advertisement of the Keystone Driller Co. of Beaver Falls, Pa., U. S. A. This firm is one of the best known manufacturers of drilling machinery in the world and is desirous of placing two or three agencies in this field.

THE PIONEER ROLL PAPER CO.

This enterprising company of Los Angeles, California, which has forged to the front as manufacturers of prepared and ready roofing, is reaching out for the Oriental trade. Mr. H. U. Robbins, their special representative, is now in the East, and will visit all the ports in China and Japan, and afterwards Manila. Interested parties wishing prices, samples, and other information, can address Mr. Robbins, care of the FAR EASTERN REVIEW, Manila.

CONSTRUCTION AND ENGINEERING NEWS

ELECTRICAL.

ELECTRIC POWER FOR CALCUTTA.—It is reported from British India that a scheme is being developed for the supply of electric power to the mills and factories along the Hooghly, the area served extending 25 miles to the northward of the town of Hooghly and 17 miles southward to Budge Budge, a total distance of 42 miles, embracing practically the whole of the works of the Calcutta district, which at present use over 100,000 hp. Besides power for industrial enterprises, electricity will be supplied in bulk to distributors and for electric traction and for lighting the premises of those using the power supply. It is not proposed to sell energy within the limits of Calcutta and Howrah, which are covered by the Calcutta Electric Supply Corporation; but trunk mains will be laid through these areas. The draft license asks for the adoption of two systems of supply—a two or three-wire direct-current supply at a pressure not exceeding 600 volts between the outer wires, and a single-phase or polyphase alternating-current supply at a pressure not exceeding 10,000 volts. The capital of the company which it is proposed to form has been provisionally fixed at $1,500,000, and will be issued in London; but the prospectus is not likely to be ready for some months at least.

ELECTRIC RAILWAY SCHEMES, INDIA.—The Government of India have under consideration two schemes for the working of railways by electricity, one in Northern India and the second in Southern India. The former is the Abbottabad *via* Domeli and Baramula to Srinagar Railway which is to be on the 3 feet 3½ inch gauge with a length of 160 miles, and the latter is the Nilgiri Railway-cum-Coonoor-Ootacamund extension. Major Joly de Lotbiniere, R. E., the designer of the Cauvery Falls Electric Works in Southern India, has been preparing the scheme for the Srinagar Railway, while for the Nilgiri-Coonoor-Ootacamund Railway the electrical scheme has already been investigated and the estimate is under consideration. There has been some talk of the electrification of the Kalka-Simla Railway also, but that project is believed to be in the distant future though the prospects of the scheme are considered to be more favorable now that the Government have taken over the line from the company which constructed it. Another mountain line, which may also come to be worked by electricity, is said to be the Rawalpindi-Murree Railway, proposals for the construction of which on the 3 feet 3½ inch gauge with a length of 40 miles are under the consideration of the Government of India.

STEAM TURBINE IN SIAM.—One of the most progressive of the independent principalities of Asia is the little kingdom of Siam, on the Indo-Chinese Peninsula. In the principal city, Bangkok, is a modern electric railway power plant, operated by the Siam Electricity Company and equipped with reciprocating engines and generators. Because of the increased demand for power, an additional unit has become necessary and a Curtis steam turbine has been decided upon as most suitable. This is a 500-kilowatt 575-volt machine, built by the General Electric Company, of Schenectady, N. Y. The boiler plant for this station is unique in that paddy husks are burned in place of coal. The fuel is brought down the river from the rice field in flat-bottomed boats to the power-house and unloaded directly into the boiler-room by an elevator and belt conveyor, operated by several direct-current 500 volt General Electric Company motors of the CE type. This method of using rice husks for fuel is an economic utilization of a waste product similar to the use of the crushed sugar cane, bagasse, on sugar plantations.

AMALGAMATION OF TOKYO TRAMWAYS.—The Tokyo Street Railway, Electric Railway, and Electric Car Railway Companies have agreed to amalgamate. The Boards of Directors at first appointed Baron Shibusawa and Mr. Makoshi as arbitrators and promised to submit to their decision regarding the terms of amalgamation. The decision was as follows:—

An amalgamated Company shall have 540,000 shares (the total number of shares of the three Companies). The shares shall be distributed as follows:—The Tokyo Electric Railway (at present 120,000 shares) to have 90,000 shares, the Street Railway (300,000) to have 312,000, and the Electric Car Railway (120,000) to have 138,000. In other words the Tokyo Electric Railway Company is to give up 30,000 shares, which shall be divided between the Street Railway and Electric Car Railway at the ratio of 4 to 6, that is, the former receiving 12,000 shares and the latter 18,000.

The decision was accepted. Meetings of principal shareholders were held at the respective Companies' offices on the 5th of June. The Tokyo Electric Railway and Street Railway's shareholders approved of the agreement, but there were a few dissentient voices raised by the Electric Car Railway's shareholders.

These three Companies convened general meetings of shareholders on the 28th of July when the question was submitted. The Tokyo Street Railway and Electric Railway Companies accepted the proposal on the condition that in case the Home Office should refuse to sanction the assignment of the Companies' rights or should alter the Company's charters into more disadvantageous ones on account of amalgamation, the provisional agreements should be annulled. The Home Office, however, is likely to sanction the amalgamation.

The directors of these tramway Companies met on the 30th ult. and decided that the new Company will have its head office on the present premises of the Tokyo Street Railway Company. They also appointed a committee of four to form the new Company.

NEW ELECTRIC RAILWAY, JAPAN.—An application has been sent in to the Government by Mr. Yasundo Hotta of Kyoto, Mr. Neiken Aizawa of Fukushima and others through the hands of the Governor of Gifu Prefecture for permission to construct an electric railway to connect Gifu station in the Tokaido Railway with Toyama in Etchu Province, viâ Takayama, Hida Province. The promoters propose that the railway shall have a capital amounting to 20 million *yen*.

THE TOKYO ELECTRIC LIGHT COMPANY.—This company has under construction the largest water power station in Japan, and, in carrying out its extensive plans, has placed large orders for miscellaneous electrical apparatus. With the exception of the water wheels and generators, which are of German manufacture, all the main station apparatus was ordered from New York. At the sub-station the voltage is reduced by transformers and distributed underground to various smaller stations within the city, and the Tokyo Electric Light Company has just ordered 250 kilowatt transformers and 78 single phase potential regulators, as well as switchboards and auxiliary apparatus.

MADRAS ELECTRIC TRAMWAYS.—The statutory return of the Madras Electric Tramways Company (1904) to April, 1906, shows that the capital is £100,000 in 25,000 preference shares and 75,000 ordinary shares of £1 each. Of the ordinary shares 71,007 has been taken up, £1 per share has been called up on 1,007 shares, the 70,000 remaining shares being considered as fully paid. The mortgages and charges are returned at £50 000.

HYDRO-ELECTRIC SCHEME, JAPAN.—Messrs. Kijuro Ito, Yohei Matsuyama and 10 other businessmen of Osaka are organizing a water-power electric company with a view to laying out an electric railway between Doton-bori, Osaka, and the summit of Mt. Koya. The organizers have decided to establish their office at Shiomibashi Station, of the Koya Railway.

NEW CABLE, JAPAN.—The laying down of cables between the Bonin Islands and Kawasaki, seven miles south of Tokyo, which had been undertaken by the Imperial Government was completed in the latter part of last month, thus effecting a connection with the American cables.

WIRELESS TELEGRAPH, CHINA.—Prince Suh has suggested to the Government to erect wireless telegraph stations at Wuchow, Hankow, Anching, Wuhu, Chinkiang, and other places along the Yangtsze.

ELECTRIC TRAMWAY EXTENSION.—The Yokohama Electric Tramway Company has decided to send in an application for official permission to extend the present lines to Nagashimacho via Horaicho along Ookagawa canal, preparatory to further extending the line to Kamakura.

ELECTRIC LIGHT, MUKDEN.—A Fengtien report states that Chinese and Japanese merchants have jointly formed an Electric Light Company at Mukden in accordance with Board of Commerce Regulations, and will instal electric lights in that city some time next month.

ELECTRIC LIGHT, KONGMUN.—The Chinese community here is inspired by the amount of profit made by the Canton Electric Company, and a movement is now on foot for the introduction of electricity into this City. A prospectus has been issued for the formation of a company with a capital of $100,000. So far one-third of the capital has been subscribed, but it is not proposed to move until the whole capital has been underwritten.

THE AMERICAN KOREAN ELECTRIC COMPANY.—This company is extending its track from the West Gate to Mapo. The line is only about three miles in length but includes a rather stiff hill where some grading will have to be done. The new branch will be open within two months.

ELECTRIC LIGHT, HANKOW.—The waterworks and electric light works at Hankow are being undertaken by the Chinese Authorities with success thus far. The sum of Tls. 800,000 has been advanced by the Government Bank, and the public are to be invited to subscribe to the shares which are to be Tls. 100 each. All necessary plant has been ordered from Germany.

TOKYO ELECTRIC LIGHT CO.—The terms of a foreign loan contracted by the Tokyo Electric Light Company are said by the *Tokyo Asahi*, to be as follows:—Amount £500,000, interest 5 per cent., issue price £92, and term of redemption 15 years. The money will be spent on the water power electricity stations on the Katsuragawa, which work will be completed by July, next year.

ELECTRIC RAILWAY, JAPAN.—A plan is on the tapis at Kumagai for the construction of an electric railway between Ashikaga, Shimozuke province, and Ota, Kozuke province, a distance of 15½ miles.

TELEPHONES, JAPAN.—Within the current fiscal year telephone exchange business will be opened first in Kofu, Otsu, Wakayama, Utsunomiya, and Takasaki; then in Shizuoka, Gifu, Toyama, Nagaoka, and Kagoshima, and lastly in Tsu, Himeji, Takamatsu, Tokushima, and Nagano. The government will also start the construction of the telephone connection between Tokyo and Fukushima in October next.

WIRELESS TELEGRAPHY, TIENTSIN.—A German company is reported as erecting wireless telegraph poles at Tongku with the object of making some experiments with Tientsin

ELECTRIC LIGHT PLANT, C. E. & M. Co.—The S. S. *Yunnan* brought out the new electric plant for the C. E. & M. Co., Ltd.

RANGOON WATERWORKS BONDS.—The financial position of the Rangoon Municipality is said to be serious. "At the present moment the town is indebted to two banks in respect of loans for waterworks and drainage to the extent of Rs. 11,400,000; against this heavy liability there is a sum of Rs. 585,990 in 3½ per cent government securities in the Sinking Fund. Consequently the net liability chargeable against Municipal funds with the new loan now needed will leave Rangoon in debt to the extent of a little over one crore thirteen and a quarter lakhs of rupees."

MOULMEIN WATERWORKS.—We hear that the Municipality have submitted its application for a loan of Rs. 100,000 in connection with its Waterworks. Out of this sum Rs. 80,000 is meant to repay the Government to this extent for having paid Messrs. Burn & Co., in settlement of their bills against the Government for constructing the Waterworks, this settlement having been come to without any reference to the Committee. The balance of Rs. 20,000 is required for repairs to service cistern, fencing in the catchment area, etc.—*Moulmein Advertiser.*

KRIAN IRRIGATION, F. M. S.—The Krian Irrigation Scheme has been completed at a cost of $1,600,000. The work was commenced in 1899. In spite of innumerable difficulties, one of the greatest pieces of engineering work in the Far East has been successfully accomplished. There are now 70,000 acres of land available for paddy planting without any fear as to failure of the water supply. At the ceremony of opening the six sluice gates of the Main Canal on Wednesday last, Mr. E. W. Birch, C. M. G., Resident of Perak, spoke of the able manner in which the work had been carried out, and expressed his appreciation of the assistance given by the Hon. Colonel A. Murray, Colonial Engineer, Straits Settlements.

CANTON WATER WORKS.—It is reported that the order for the machinery for the new waterworks has been placed with Messrs. H. M. Schulz and Co. of Shanghai, and the pipes have been ordered from the Kiangnang Arsenal. The company has already begun the construction of the water-basins and filter-beds.

BANKGKOK WATER SYSTEM.—The Siamese War Department advertises that tenders are required for the supply of W. I. & C. I. pipes together with various accessories for the erection of Water Supply System.

CHEMULPO WATERWORKS.—In connection with this expensive and uncalled-for scheme it appears that the Finance Minister and a number of Japanese have been inspecting the bank of the river opposite Seoul where the intake is to be constructed. Some 50 houses and 60 graves have been ordered to be removed but the owners, who have observed the fate of their friends across the river are demanding their money first.—*Korea News.*

IRRIGATING PUMPS, JAPAN.—The inhabitants of the united villages of Niikawa, Ohama, Tanao, and Asahimura, in Aomi district, Aichiken, have installed in that district the Worthington centrifugal pumps for the purpose of irrigating an area of land which is 36 feet above the source of water supply. The pumps cost 37,900 *yen*, and the land thus irrigated measures 335 *cho* in area. The measure, which has already proved a success, will double the producing capacity of the district.

WATERWORKS, SWATOW.—Siu King Shan and twenty-three other capitalists have commenced raising funds for the works, and applied to the Board of Commerce for registration. The date for commencing the work has been reported to the Viceroy for protection. The way of raising subscriptions is in accordance with the commercial regulations, under the supervision of Shum Yau Shi, and is exceedingly satisfactory.

THE SEWERAGE OF TOKYO.—The *Jiji* once more urges upon the city authorities the necessity for constructing a decent sewerage. The present system, or rather want of it, together with the microbe-breeding gutters, ditches and moats, is highly detrimental to the health, and, in every respect, unworthy of the great capital.

BRIDGES.

YANGTSZE BRIDGE PROJECT.—Viceroy Chang Chi-tung is contemplating the erection of iron bridges to connect Wuchang and Hankow, and to connect Hang-yang and Hankow, to replace the ferry boats. One bridge would be over the Yangtsze and one over the Hsiang. The bridges will also serve as connection between the railway lines north and south.

YALU RIVER BRIDGE.—According to the *Japan Gazette* the work of bridging the Yalu has been under investigation for a long time. All arrangements as to spans have already been concluded and the work will be commenced after practical investigations by the engineer concerned. The bridge will be a 16-spanned one about 3,400 feet in length. It is little shorter than the Tenryu bridge on the Tokaido Railway and almost equal to that over the Opi river on the same railway. The Yalu bridge will be about 40 feet above the normal surface of the river, as it is to be constructed in anticipation of floods and in order to allow junks sailing beneath.

Canton Buildings.—Work on the pile foundation for Messrs. Arnhold, Karberg and Co.'s new building on Front Avenue is being pushed ahead.

The old two story building, used since 1879, has been removed to give place to the new structure. This building is to be a six-story reinforced concrete structure with up-to-date appliances, such as elevators, sanitary fittings, etc. The exterior walls are to be faced with ornamental brick and granite.

The ground floor is to be used as a godown and machine display room, while the floors above will be used by the firm for office and residential purposes. A roof garden will be a feature of this place while the back portion of the roof will be used for servants' quarters, kitchen stores, etc.

Custom House.—The I. M. Customs buildings, one for the indoor staff and the other for the outdoor staff, are well under way. These buildings are of a very substantial character, and will add much to the architectural beauty of Shameen. In fact, the former building will cover more ground area than any other single building on Shameen, and with the single exception of Messrs. Arnhold, Karberg and Co.'s new Hong will be the largest Shameen building. It will be handsomely finished in hardwoods, and will be of brick, steel and concrete construction.

The building upon completion will be occupied by married assistants of the Customs, on the Western side; and unmarried assistants on the Eastern side, together with the entire third floor, and the completion is being looked forward to by them with considerable pleasure. Our local architects, Messrs. Purnell and Paget, have these three buildings in hand, and we are sure these will add still further to the many landmarks in Canton of this firm.—*S. C. Morning Post.*

Federated Malay States Railways.—1. Tenders are invited for the supply only of the Iron and Steel work in connection with a dome, etc., for the tower of the Terminus Building in Penang.

2. The General Condition of Contract, Specifications, drawing and forms of tender and agreements may be seen and all other particulars may be had at the office of the General Manager for Railways, Kuala Lumpur, Divisional Engineer, North, Taiping, and the Foreman, Terminus Building, Penang.

3. Tenders must be upon official forms and delivered in sealed covers addressed to the General Manager for Railways, Kuala Lumpur, and marked "Tender for Steel Work for Tower," on or before the 3rd September, 1906.

4. The Government does not bind itself to accept the lowest or any tender.

Buildings, Tsingtau.—An official report, states that during last year active building operations were carried out at the port of Tsingtau. 54 European residences, 26 mercantile buildings including a soap factory and three steam kilns, 12 godowns, and 11 Chinese residential and business houses were erected.

New Club House, Tientsin.—The New German Club house in Wilhelm Strasse is fast approaching completion. The heavy stone fronting and interior ironwork have been most judiciously utilized for solidity and strength, without producing the effect of over-massiveness.

New Cathedral, Rangoon.—The Consulting Architect to the Government of India has given high and deserved praise to the work on the new Roman Catholic Cathedral, Rangoon, which he thinks the finest masonry building in India. The wonderful part of it is that except the builder, a Roman Catholic priest from Europe, the workers are all Indians trained by himself without any other supervision. The place is well worth a visit by those interested in buildings. Not only the construction, but the mode of carrying out the work, are said to be well worth the study of those concerned with like undertakings.—*Indian Engineering.*

Steel Works, Japan.—As a site for the proposed Japan Branch of Armstrong and Co., there has been purchased an area of some 20,000 "tsubo" (one "tsubo" 3.9538 square yards) at the mouth of the Sakaigawa, near Hiratsuka. The expense of the wooden fence around the grounds alone is said to have reached Y. 20,000. Upon the completion of the proposed factory it is expected to take the lead in its line in this country, and to meet every demand. It is said that the Japanese Government has included in the contract with the Company the option of purchasing the branch after a certain term of years.

Steel Works, Tairen, (Dalny).—An Osaka report states that several prominent business men in Tokyo and Osaka contemplate establishing an iron foundry in Tairen with a capital of 30 million yen. Some experts will shortly be dispatched to Tairen with a view to carrying out the necessary investigations. The foundry will get its coal from Fushun and its ore from Taya, and produce mainly rails and materials for shipbuilding.

Steel and Iron Works, Japan.—The Meiji Ironworks Company to be organized by Messrs. Hakamada and Yamagashi will have a capital of 500,000 *yen* and establish its workshops in Tokyo and Naoyetsu. The capital is divided into 10,000 shares, of which 6,500 shares will be offered to the public for subscritpion.

Gun Factory, Near Baikal.—A St. Petersburg telegram of July 11, which is published by the *Asahi*, states that the Russian government is making arrangements to establish an arms factory east of Lake Baikal for the purpose of supplying the troops in the Far East.

Huangpoo Conservancy.—An agreement, between Taotai Jui and Commissioner Hobson, who represents the Chinese Government, and Mr. J. de Rijke, dated 7th June, 1906, has been published by the *Universal Gazette*. By the agreement Mr. de Rijke has been entrusted with the work of conservancy of the river Huangpoo, but all the works shall first obtain the consent of the Conservancy Board and the engineers to be employed will be nominated by Mr. de Rijke but with the consent of the Conservancy Board. The term of the agreement is three years counting from the 7th June, 1906, and six months notice is required to renew the agreement in case the works shall not be completed within three years, and such extension of the term of the agreement shall not be over two years and further extension shall be made if necessary in a similar manner. The office and residence for Mr. de Rijke will be provided by the Chinese Government, but if Mr. de Rijke has a residence for his family of his own accord such shall be paid by himself. During the term of the agreement Mr. de Rijke shall solely devote himself to the works of conservancy and extra jobs shall not be carried out by him unless with the consent of the Chinese Government. The salary of Mr. de Rijke is £3,000 per year and he will be paid from the 4th November 1905, to the date of agreement at that rate, etc.—*Mercury.*

Chemulpo Harbor Improvements.—With reference to the projected improvements at Chemulpo Harbor, it is now stated that arrangements are being made to carry out the work on a large scale.

According to present plans, an area of 42,300 square metres, immediately in front of the Custom House, is to be reclaimed from the sea, and is to form the site of a jetty about sixty ken in length and a landing place of three hundred ken. Ten godowns are to be constructed near the landing place.

Wet Dock, Sasebo, Japan.—A plan for constructing a gigantic wet dock is mooted at Sasebo. According to the plan, two islands, in front of the naval arsenal at that port, are to be connected by a break-water, and the inside of the break-water is to be converted into one big wet dock. When constructed, the dock will be able to take in a great number of warships all at once.

Yellow River Conservancy.—The engineering works on the banks of the Hoangho which are being made to prevent this stream from overflowing have been commenced at a point between Hotang and the provisional telegraph office on the sand-bank in the river.

Steel Towboat.—The Shanghai Dock and Engineering Co., Ld., launched on the 6th of August from their Pootung Works the single screw steel towboat *Daisy*, built to the order of Mr. G. McBain for the Matts-chappij-Tot Mijn Boschen Landbouwexploitatie in Langkat. The following are the dimensions of the boat:—Length over all 100'; Length between perpendiculars 105'; Breadth 20'; Depth 17'6". The engines are vertical compound, direct acting, surface condensing, having cylinders 16 and 36 inches in diameter by 24 inches stroke. The boiler is a single ended steel cylindrical return tube type, and arranged to burn oil fuel on arrival at her destination.

New Dredge, Manila.—A new 12-inch suction dredge to be called the Pasig has been launched by the Atlantic, Gulf and Pacific company. The Pasig is a counterpart of the giant dredge Manila with which the company has been prosecuting its lower river and bay work, except for its peculiar adaptability to work, up the river above the bridges under which the Manila could not pass.

The new dredge is equipped with a collapsible house deck and hinged stack which will permit of its passing under the bridges spanning the Pasig and devote itself to work laid out for it up the river.

As soon as it is launched it will start pumping and terraplaning up the river where the company has contracts for filling in the low lands which are often flooded during the rainy season when the Pasig breaks over its banks.

Launch of the Fushimi.—The launching and christening of the new Japanese shallow draft river gunboat "Fushimi" took place at the branch yard of the Kawasaki Dockyard Co., Shanghai, on Aug. 8.

The "Fushimi" when completed will be the fastest and most powerful shallow-draught gunboat on the Yangtsze river. Her dimensions are: length between perpendiculars, 160 feet; breadth, 24 feet 6 inches; draft, loaded, 2 feet 3 inches; displacement, 180 tons; and her designed speed is to be 14 knots. She was built by Messrs. Throneycroft and Co., in England, and sent out to Japan in sections, and then sent on to Shanghai, where she was put together.

The Mitsui Bishi Dock Co.—This company has decided to construct a floating dock of 11,000 tons. The floating dock will be placed at Kobe. The completion of the proposed dock is to be expected about May next and the arrival of the same at Kobe about July.

Moji Dock Company.—The application for the establishment of a dock company at Moji has been filed with the Government. The prospectus of the new firm includes, it is reported: capital Y3,500,000; Constructing two dry docks—No. 1, 480 feet long, 60 feet wide, 28 feet deep, suitable for vessels of 7,500 tons; No. 2, 600 feet long, 75 feet wide, 30 feet deep, for vessels of 12,000 tons; accepting orders for shipbuilding of vessels under 5,000 tons. The yards will be constructed at Okubo.

Launch of the "Chu-yu."—The Chinese Gunboat "Chu-yu," has been launched at The Kawasaki Dock Co., Kobe. This is the third of six sister boats contracted for the Chinese Navy. 200 ft. long, draught 8 ft., displacing 740 tons and intended to travel 13 knots. She carries two 12c.m. q.f. guns, two 12pr. q.f. guns and four maxims.

Chinese-Built Lighters.—The Imperial Naval Yard at Tongku has completed putting together two large light draft lighters which are to be employed in the conveyance of salt at Pehtang, and were constructed in parts in Holland to order of the Salt Commissioner, and arrived some two months ago. These are the first boats of their kind put together in these waters by Chinese.

Torpedo Boat Destroyers, Japan.—During the late war the Naval authorities started the construction of 29 destroyers with a portion of the war expense. So far 22 of them have been completed and the rest are as follows:—The *Shirotae, Uzuki, Minazuki, Nagazuki, Kikuzuki, Yunagi* and *Matsukaze*. All these destroyers are expected to be launched shortly.

Osaka Iron Works.—A trial run of the destroyer *Hayakaze* built by the Osaka Iron Works, was carried out in the sea of Tenpozan on August 1st, ulto. The vessel ran for one hour at full speed, and was in the second stage of the run, when a cylinder was damaged and she had to return to the works again. She is now being repaired for another trial run.

Uraga Dock Co., Japan.—A general meeting of the Uraga Dock Company will be held on the 18th of August at the Geographical Association building when a dividend will be declared at the rate of 6.5 per cent per annum. The rumor concerning the acquisition of the dockyard by the Government is unfounded.

New Steamers, Japan.—The Mitsui Bussan Kaisha is reported to be contemplating constructing three steamers for its use, each about 3,000 tons.

Guet Han Railway.—Railroad help wanted by the Kwang-Tung Mercantile Administration of the Yuet Han Railway Company, Limited, in the Kwang-tung section. Chinese civil engineers or engineering students having experience in railroad preliminary, location and construction. Must be capable of handling any kind of railroad instruments on field work.—Address applications, giving training, references, experience and samples of work, to H.E. Chang, President of the Kwang-tung Mercantile Administration of the Yuet Han Railway Company, Limited, Canton.

The Kwang-Tung Mercantile Administration of the Yuet-Han Railway Co., Ltd.—Tenders are invited for five first-class, five second class, and ten third-class coaches, two baggage cars and twenty dump cars—capacity five cubic yards. The Coaches are to be the same style as the First and Second-Class Coaches of the Sam-Shui Division, with the exception of the length, which will be 60ft. over end-sills.

The Third-Class Coaches are to be the same as the Second-Class Coaches of the Sam-Shui Division with the exception of the interior finish, and the seats to run longitively—the sides and double-centre seats.

Bidders will be required to state the net cost and time of delivery free alongside the wharf—Wong Sha.

Tenders will be opened in the Head Office, Canton, on the 23rd day of August, 1906, at 11 a. m.

The Company reserves the right to reject any or all tenders.

Chang To Chai,
President.

Canton, August 9, 1906.

Ceylon Government Railway.—Messrs. Robert Stephenson & Company, Ltd., of Darlington, have lately received an order from the Crown Agents for the Colonies for six locomotive tank engines for the Ceylon Government Railways. The locomotives are to have six wheels coupled with a pair of leading wheels and a trailing bogie. The cylinders will be 19 in. stroke and 26 in. diameter. The same firm have also received a "repeat" order from the Aranco Railway Company for additional rolling stock similar to an order Messrs. Stephenson are now completing for the same company.

Supply of Sleepers.—Messrs. Millars' Karri and Jarrah Co., Ld., have completed their contract with the Assam-Bengal Railway for the supply of 20,000 Jarrah wood sleepers, which are required for renewals in the Chittagong and Haflong Districts. For renewals in the Third Section (Gauhati-Lumding-Tinsukia) the A.-B. Railway Company have arranged to use 5,000 Ajar wood sleepers and 35,000 Nabor wood sleepers (local).—*Railways.*

Burmo-Chinese Railway.—Calcutta, 1st August.—The Anglo-Chinese negotiations for carrying on a projected Burmo-Chinese railway is approaching completion. The first section of the line—Bhamo to Tengyueh—will be a joint Anglo-Chinese undertaking. The second section, which ends at Yunnanfu, will be a wholly Chinese undertaking. China is also arranging for the purchase of the French railway from Tonquin into Yunnan.—*Straits Times.*

Locomotives for India.—The North British Locomotive Company have contracted to build 60 locomotive engines for two of the Indian Railways.

CANNING COMPANY, JAPAN.—A fish canning company styled Dai-Nippon Suisan Kabushiki Kaisha is being organized by a number of prominent business men in Tokyo. The Company will open a subscription list for its shares, amounting to 3,000,000 *yen* in face value, on August 1. Applications for subscription have, however, greatly over-reached the amount of shares to be issued. The organizing committee of the Company invited the Press representatives to the Seiyokon, Uyeno, on Saturday, and Lieut.-General Enya, chairman of the committee, delivered a speech, stating that the catch of fish in Japan was more than needed by the country and it could be made more if necessary. But, he said, the country lacked the means of preserving fish and turning the catch to the best profit. The Company aspired to fill the gap, and intended to start its business by curing sardines in olive oil. The Company has its office at Honhacchobori, Kyobashi-ku, Tokyo.—*Japan Times.*

CHINESE GOVERNMENT INDUSTRIES.—Referring to the proposal of the Shangpu to establish Government paper mills and printing offices at Peking, Tientsin, and Shanghai, it is reported that this proposal has received the sanction of the Throne. The paper mills will manufacture foreign as well as Chinese paper of different sorts for Government use in the various provinces. The printing offices will be used exclusively for printing books, etc., for the use of the various Government and private schools and colleges in the Empire. Europeans and Japanese are to be engaged as foremen of the establishments.

OIL MILL, HONAN.—Besides the introduction of European machinery into coal mines in this Province, there has been formed in Chouchia Kou a syndicate for crushing sesame oil. A complete crushing plant has been ordered from abroad and is now on the way. The shares are Tls.100, and about Tls. 300,000 have already been subscribed. Three of the wealthiest families in Chouchia Kou are the financiers.

TEXTILE COMBINE, MANCHURIA.—Fifteen of the largest Moscow textile manufacturers, not competing with each other, have combined to construct a central wholesale textile depot at Harbin, on the same plan as that opened at Omsk, in western Siberia, in 1904, by the same firms. The depot buildings have to be completed by April, 1907. On the initiative of the firms interested a special expert commercial commission will study local wholesale conditions in Herbin and neighborhood, as well as the markets and trade routes gravitating to that city from Mongolia and China generally.

SILK SPINNING FACTORY, SHANGHAI.—Under the joint proprietorship of the Kyoto Silk Spinning Company and a Shanghai merchant named Li Yunchi a silk spinning factory has been established at Shanghai. The proprietors each contributed a capital of 20 million taels. The Kyoto Company has therefore closed its factories at Wakayama and Koriyama, and removed the machinery and plant to Shanghai. The factory will make silk thread from Chinese cocoons.

NEW SUGAR REFINERY, JAPAN.—The office of the Sugar Refining Co., under the auspices of Messrs. Kobei Abe, Masuzo Masuda and several others, with a capital of Y1,500,000, has been opened at Minami Naka-dori Sanchome. The factory of the new firm near Kawasaki is under construction.

CEMENT FACTORY, CANTON.—Some time ago the Viceroy ordered machinery from a German firm on Shameen for the manufacture of cement. The site for this factory has been selected in a place at the extremity of Honam. The erection of the factory was commenced recently with Taotais Wen and Kung as directors.

ICE FACTORY, CANTON.—The building for the new ice-works will commence at once and the machinery is likely to be set up and in working order by early next spring.

OSAKA SUGAR REFINING CO.—The directors of this Company have decided to resign in a body in consequence of the disagreement with shareholders regarding the heavy loss sustained on the last half-year's working. The directors have given notice of resignation and also propose to withdraw the resolution to establish a refinery in Formosa. The shareholders, however, demand a special meeting to decide upon the course to be taken.

CELLULOID COMPANY, JAPAN.—The *Tokyo Asahi* states that a celluloid company with a capital of 5,000,000 *yen* will be organized in the vicinity of Osaka, under joint ownership of Japanese, British, French, and German businessmen. Baron Shibusawa and Dr. Soyeda are among the promoters.

FERTILIZER COMPANY, JAPAN.—A company called the Teikoku Hiryo Kabushiki Kaisha (Imperial Fertilizer Company) is being organized by Messrs. Makoshi, Satake, Hiranuma, Fukuzawa, and other Japanese and foreign business men. The company will have a capital of 3 million *yen*, and engage in the manufacture of phosphatic fertilizer.

OSAKA GLASS WORKS.—The construction of the Osaka Glass Works having been completed, the manufacture of glass will commence at the end of August. The company intends to manufacture plate-glass valued at *yen* 1,200,000 per year. This factory is the first establishment of its kind in Japan.

COTTON MILL, OSAKA.—A plan is mooted to establish a great factory for weaving cotton shirtings in Osaka. It is proposed that it should have 30,000 spindles and 500 looms. Mr. Sanji Muto of the Kanegafuchi Cotton Mill, is carrying out investigations in this connection.

NEW MINT, YUNNAN.—The Viceroy of Yunnan has been granted conditional permission to start a mint for coining copper and silver money for the use of the Yunnan-Szechuen railway.

COTTON MILL, KOREA.—The Korean Government is going to establish a cotton ginning mill at Mokpho at a cost of 27,000 *yen*. The plant will be supplied by Osaka, and the construction completed by November next.

DISINFECTING PLANT, AMOY.—The American Consul at Amoy, China, has requested the government to give him a disinfecting station similar to the one at Hongkong.

THE JAPAN SUGAR REFINING COMPANY.—This Company is said to have agreed to amalgamate with the Osaka Sugar Refining Company.

BABCOCK & WILCOX BOILERS.—Messrs. Babcock & Wilcox have received the following orders recently for their Patent Water Tube Boilers through their Indian Agency:—

The Ahmedabad Fine S. & W. Co., Ahmedabad, one boiler.

The Ahmedabad Ginning & Mfg. Co., Ahmedabad, one boiler.

Mr. C. Olcese, Parbhani, one boiler.

The Saraspur Mfg. Co., Ahmedabad, one boiler.

The Bombay Tramway and Electric Supply Company, four boilers of 1,000 H. P. each. This makes the third order for this Company, making a total of eight boilers of the same size.

The Bombay Port Trust, Bombay, one boiler.

The Hindustan Pressing & Mfg. Co., Ltd., one boiler, this being a repeat order.

The Hindustan S. & W. Mill, Bombay, solid drawn steel steam and feed piping. This is an innovation of steam and feed pipe work in India, all the branches including as small as 2″ being riveted on and entirely of steel; the valves in this installation being also cast steel. This, we think, is the first instance in India wherein a steam and feed range for a large mill no cast-iron is used.

The Baroda State, Baroda, solid drawn steel steam and exhaust piping for the Electric Light Station, Baroda, through Messrs. Macbeth Bros. & Co., Bombay.

Three boilers were supplied a short while ago to the Bomanjee Petit Mill, Mahaluxmi, Bombay, and were started this week. These boilers have been supplied with Babcock and Wilcox Patent Chain Grate Smokeless Stokers and have proved a great success, two boilers driving the whole mill, and that at any time no smoke is to be seen from the chimney, which is a very great contrast to the chimneys of the surrounding mills. These were also supplied with steam and feed piping.

COMMISSION AGENCY, MANCHURIA.—The *Nichi Nichi* reports that a plan is on foot in Tokyo for the establishment of a commission agency in Manchuria with a joint capital contributed by Japanese and Chinese. According to the scheme of the promoters, both Governments also are to have an interest in the concern, just as they have in the South Manchurian Railway Company; and the agency is to be named the "Manshu Itaku Hanbai Kabushiki Kaisha." The principal line of the company's business, it seems, will be to act as selling agents for Manchurian merchants, but they themselves will also engage in manufacturing, working mines, felling timber, and the transportation of goods by sea. It is said that the Financial Minister and Mr. Ishizuka, Chief of the Kwantung Civil Administration Office, have already given their approval to the scheme; and the plan is apparently approaching maturity.

(*Japan Mines*)

SUBMARINE TIN DREDGING, SIAM.—One of the latest and most enterprising tin ventures is, says the Bangkok *Times*, that of Captain Miles who has formed the idea of dredging the ore from the bottom of Puket Harbor, in Siamese Malaya, from a depth of some eighteen feet or so. Experimental dredgings and borings have proved that there is a good deal of tin at the bottom of the bay, and Captain Miles has been in Bangkok for some little time in treaty with the Siamese Government, for a concession of the right to dredge the bay for the tin. In return for the grant Captain Miles is prepared to dredge a deep water dock at Puket, and a channel leading to it of sufficient depth to accommodate ships of twenty feet draft and under. Little doubt is entertained that the concession will be granted.

TIES FROM JAPAN.—Pres. Harriman of the Southern Pacific Ry. has contracted for a large order of railroad ties from Japan. These ties are being delivered at Guaymas, Mexico, for 56 cents [gold] each, and will be used in building the new road in the states of Sinaloa and Sonora to connect with the main line of the Southern Pacific at Benson.

MANCHURIAN EXHIBITION, MUKDEN.—The much-talked-of Manchurian Exhibition will be opened at Mukden on the 1st October. The Government will probably build the premises for the Exhibition, and its promoters, who are the Chambers of Commerce at Tokyo, Osaka, Kyoto, Nagoya, Yokohama, and Kobe, will make efforts to persuade our merchants and manufacturers to send exhibits there.

JOSHUA HENDY MACHINE WORKS, SAN FRANCISCO.—The plant of the Joshua Hendy Machine Works, at Bay and Kearney streets, San Francisco, Cal., was entirely destroyed by the fire following the recent earthquake. They will put up extensive works with all modern improvements in pattern shop, foundry and machine shop, and will be in the market for tools and machinery of all kinds.

JAPANESE OIL CONTRACT.—Cabling recently the *Mainichi's* special representative at Washington states that the Petroleum Refining Company of California has made public the signing of a contract with the Japanese Government for the supply to the latter of 2,000,000 barrels of petroleum annually for ten years. It is understood that the oil is to be used as fuel for Japanese warships.

YALU NEW TIMBER COMPANY.—The Japanese are now seeking to promote a Chino-Japanese Timber Company for the timber on the Yalu, each country furnishing half the capital of 2 500,000 yen. The head office will be at Tokyo with a branch office at Antung and it is said to be one of the first matters the new Minister will take up after he has presented his credentials.

PATENT MEDICINE COMPANY, SHANGHAI.—A company has been formed in Shanghai for the purpose of extending the sale of the late Mr. Peter Sys' well known remedy for dysentery and kindred diseases. Mr. Thomas Freeman, a representative of the company, is proceeding on the "Thomas" to the United States, where he hopes to get the Government to adopt the remedy for use in the Army.

PUBLIC WORKS LOAN, INDO-CHINA.—M. Beau, the Governor-General of Indo-China, is on his way to France to consult the Home Government about raising a public works loan for the Colony. The naval and military defences of the Colony will also, it is said, be discussed, M. Beau will return to Saigon in a few months.

MITSUI BUSSAN KAISHA.—There have been changes in the posts of managers of the branch offices of the Mitsui Bussan Kaisha, as follows:—

Mr. Seijiro Tanaka, Moji, to be Manager of the Hongkong branch.

Mr. Shingo Minami, Hongkong, to be attached to the head office.

Mr. Masanao Kobayashi to be Manager of the Nagasaki Branch.

Mr. Ippei Nakamaru, Singapore, to be assistant of the Moji Branch.

Mr. Tokutaro Hayashi, Assistant at Shanghai, to be Manager of the Singapore Branch.

THE CULTIVATION OF MAGUEY IN THE PHILIPPINE ISLANDS

(Continued from page 132.)

The following New York quotations for sisal hemp and for "Fair Current" Manila indicate the relative value of Manila hemp and good machine-cleaned maguey:

	1902.	1903.	1904.	1905.
Aug. 2:	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Sisal hemp	9 to 10	7	7¼	....
"Fair Current" Manila	10½	8	9¼	....
Nov. 1:				
Sisal hemp	8¾	7½	8	....
"Fair Current" Manila	10¼	8⅞	9¾	....
Feb. 1:				
Sisal hemp	....	7 to 7¼	7¾	7¾
"Fair Current" Manila	....	8¼	9½	10
May 1:				
Sisal hemp	....	9 to 9¼	8½	7⅜
"Fair Current" Manila	....	9½	....	9½ to 9⅝

The following table shows the output and value of Yucatan sisal from 1900 to 1905:

Year.	Bales.	Value. Mexican currency.
1900	499,634	$22,616,032.71
1901	517,519	22,783,453.73
1902	528,246	36,432,791.11
1903	590,480	33 481,003 51
1904	606,008	32,022,568 45
1905 to Sept. 1	370,056	18,036,045.19

USES.

The most important use of sisal hemp and maguey in the United States is for the manufacture of binder twine. This fiber is also largely used for tarred lath and fodder yarns, and for other cordage purposes.

In Yucatan and South America sisal is employed for cordage, nets, lines, hammocks, saddlecloths, girdles, bridles, etc. The Yucatan sisal hammocks, made from carefully prepared, hand-cleaned sisal, are remarkably strong and durable.

In the Philippine Islands, particularly in the Visayas, considerable maguey fiber is produced for local use. The young and tender leaves are selected and are cleaned by the scraping process used for cleaning pineapple leaves. The fiber thus obtained is soft and fine, and is used for making delicate handkerchiefs and cloth. Maguey is also used to some extent, in the localities where it is cultivated, for making various kinds of cordage.

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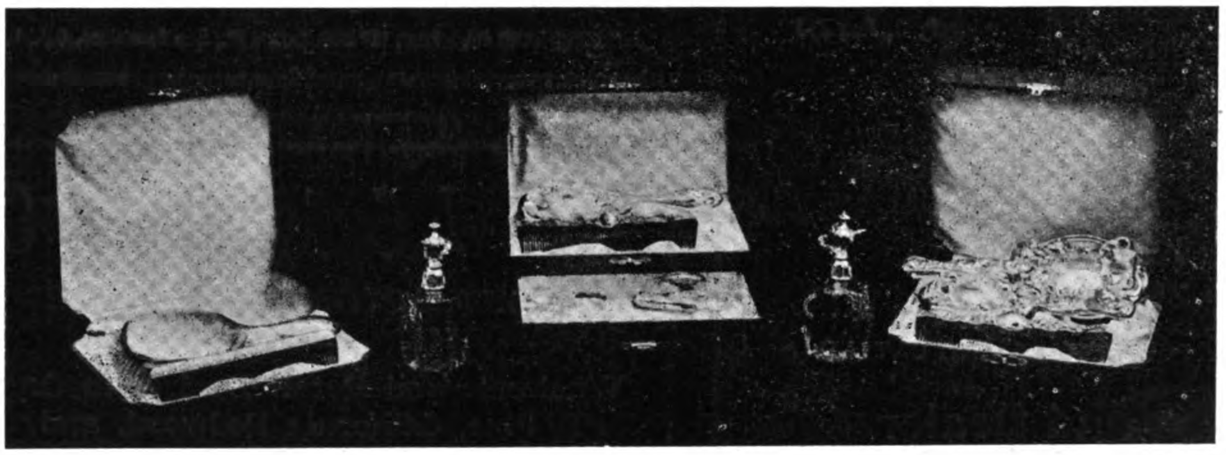

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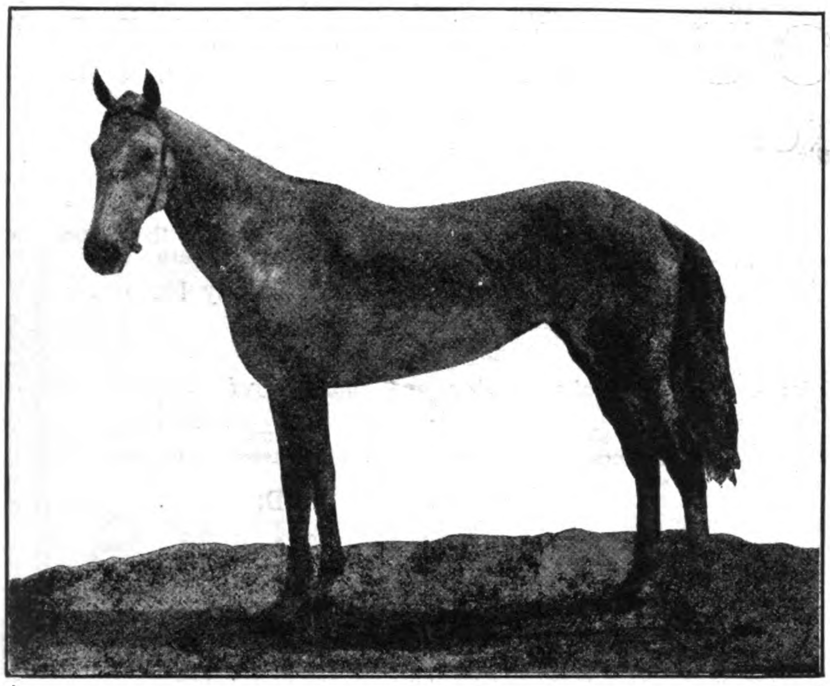

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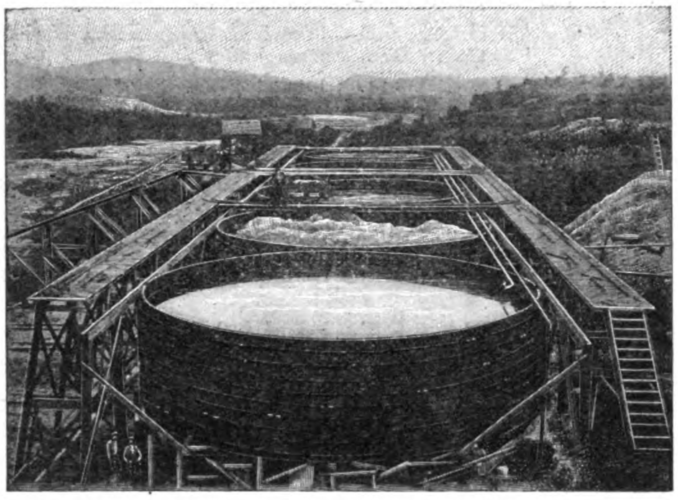

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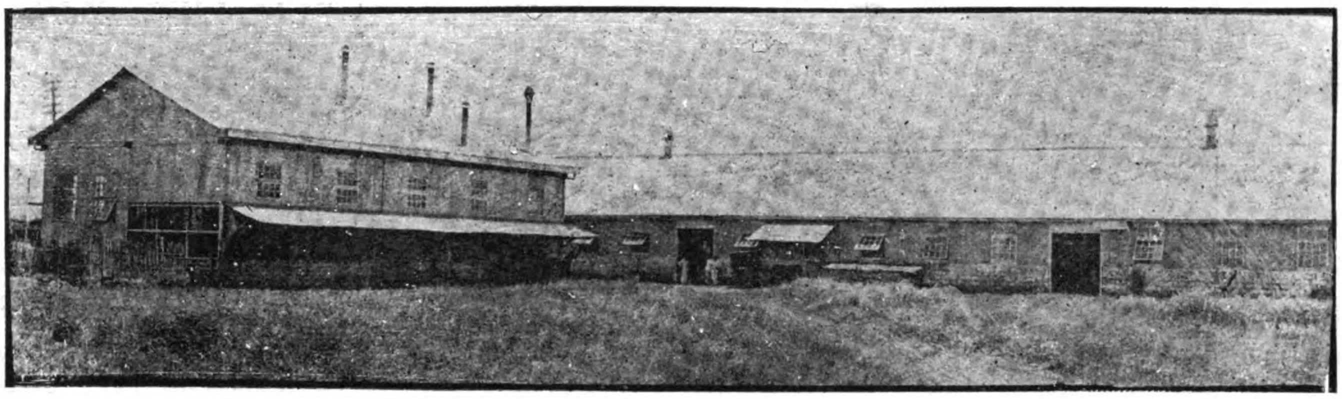

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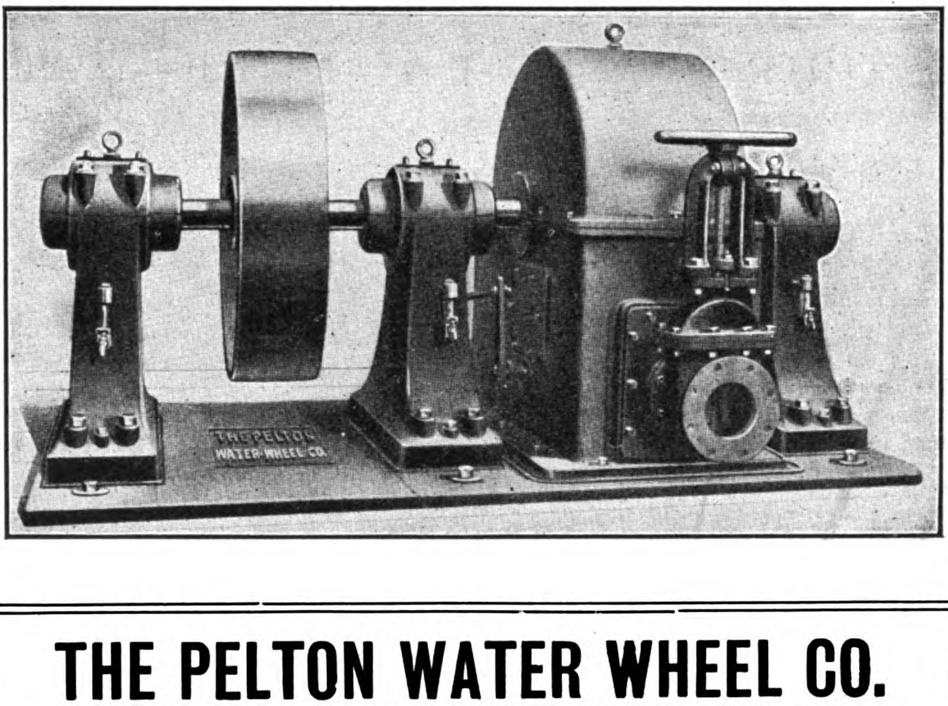

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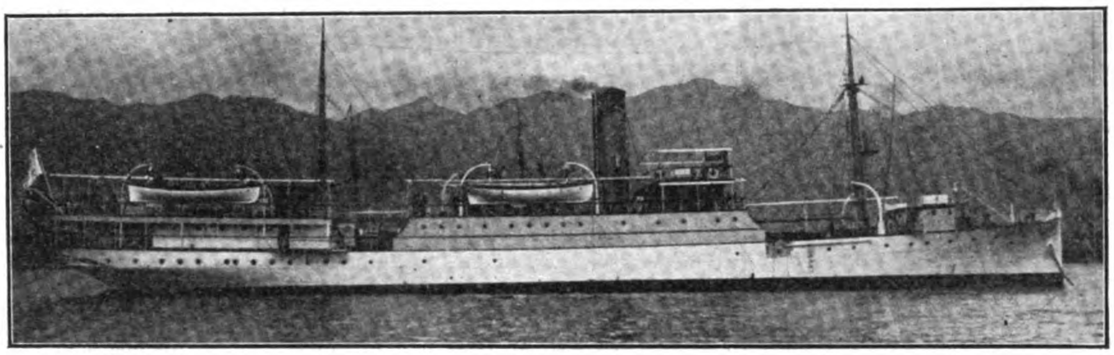

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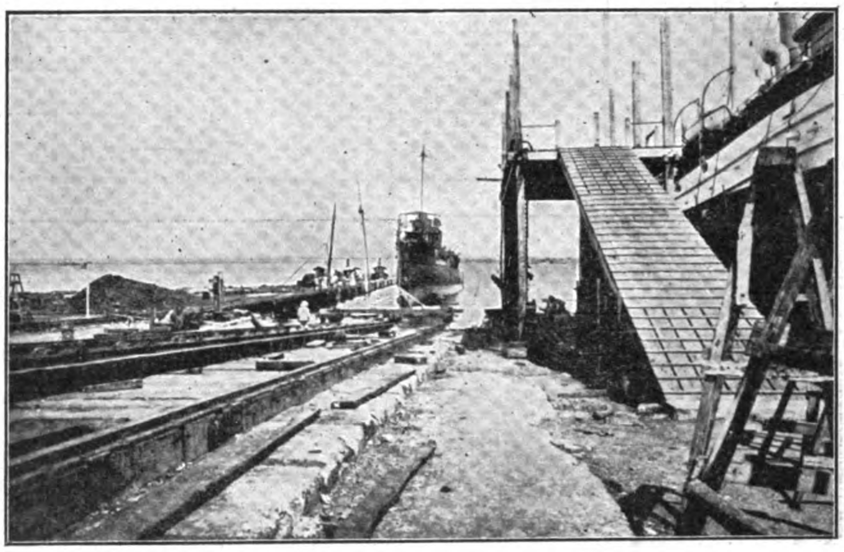

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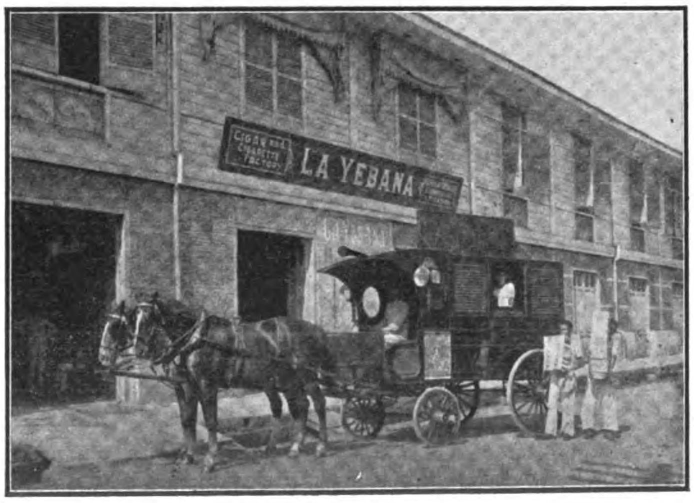

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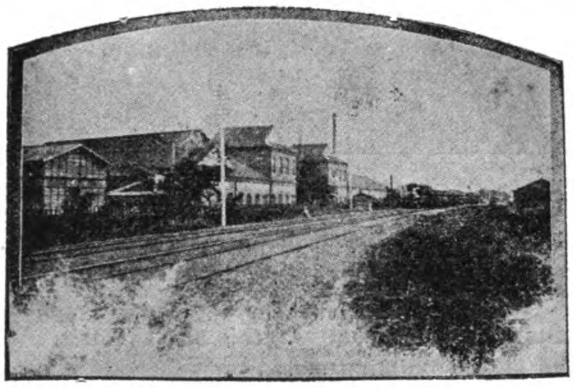

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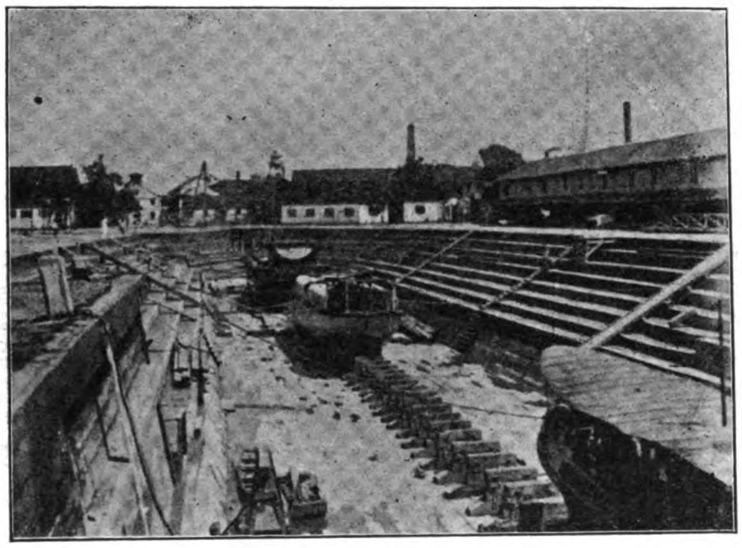

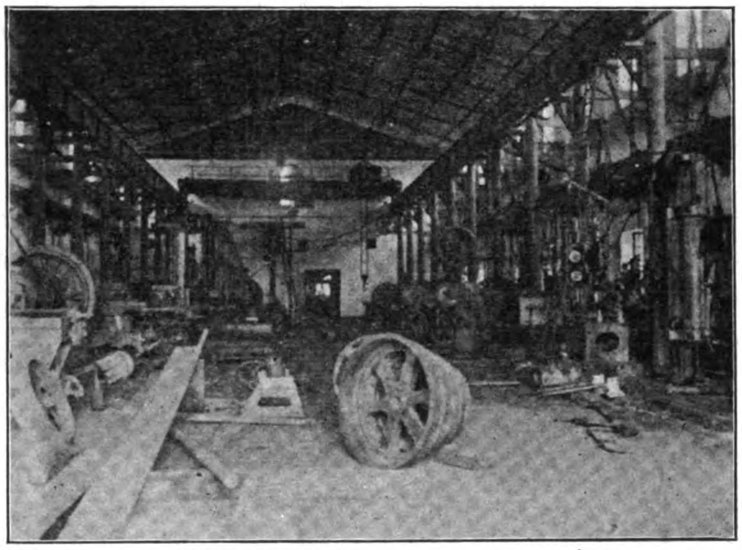

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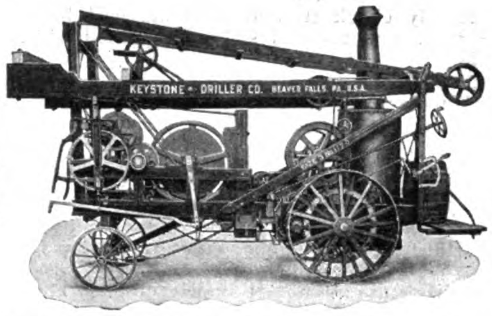

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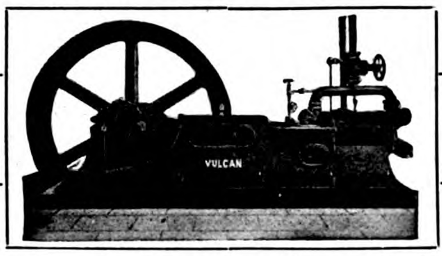
VUL  CAN

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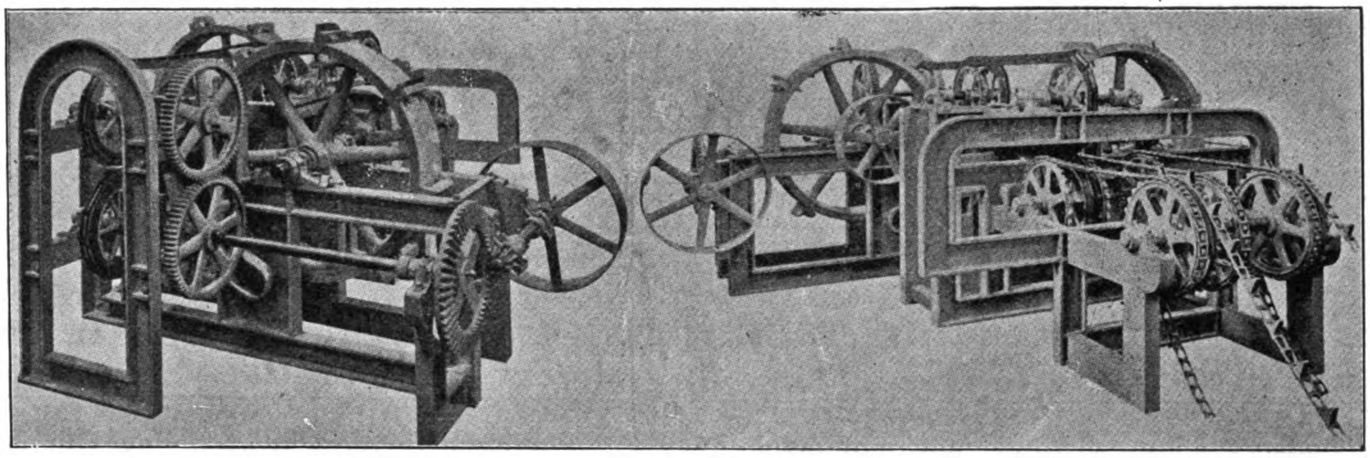

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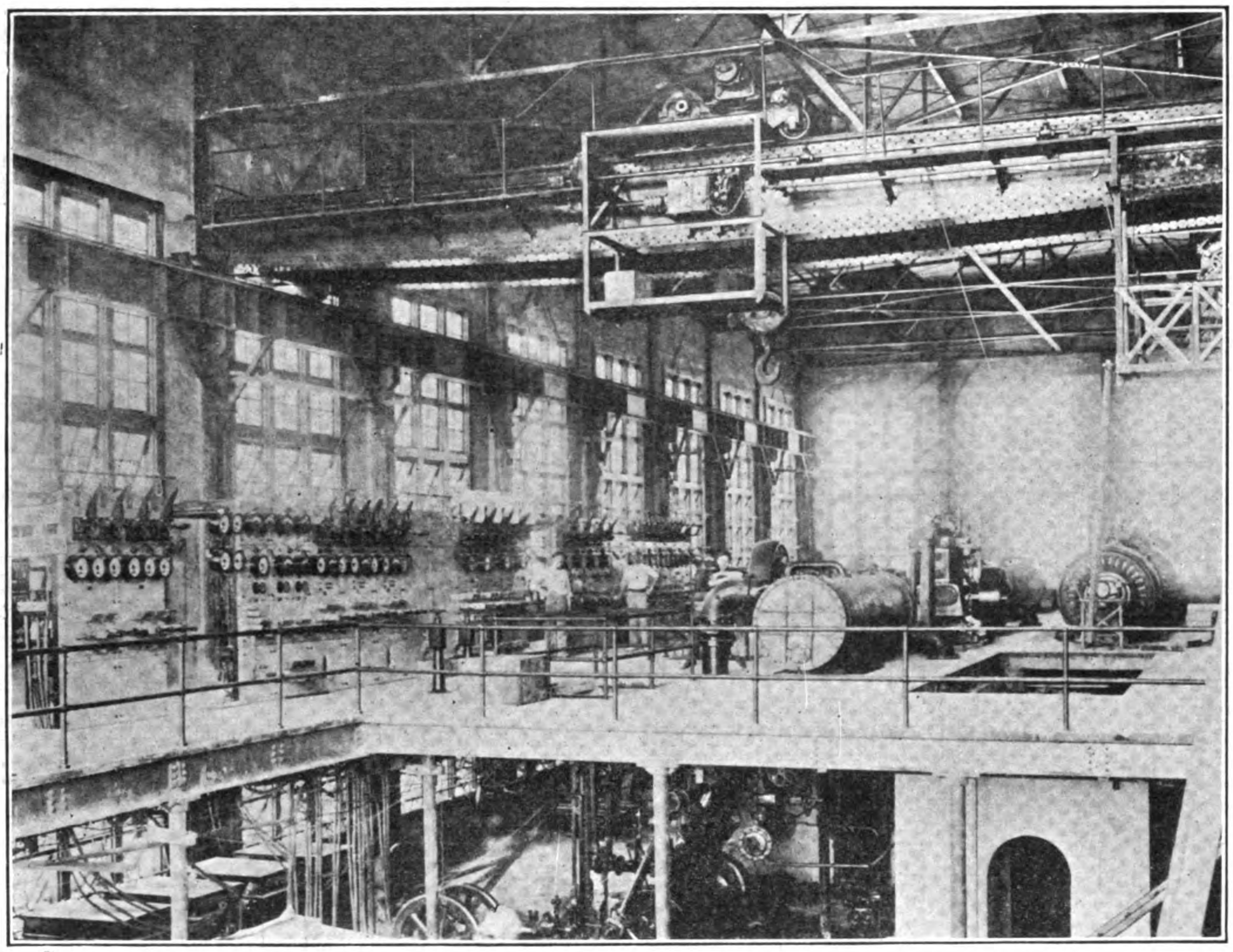

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COMMERCE · ENGINEERING · FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, OCTOBER, 1906. No. 5.

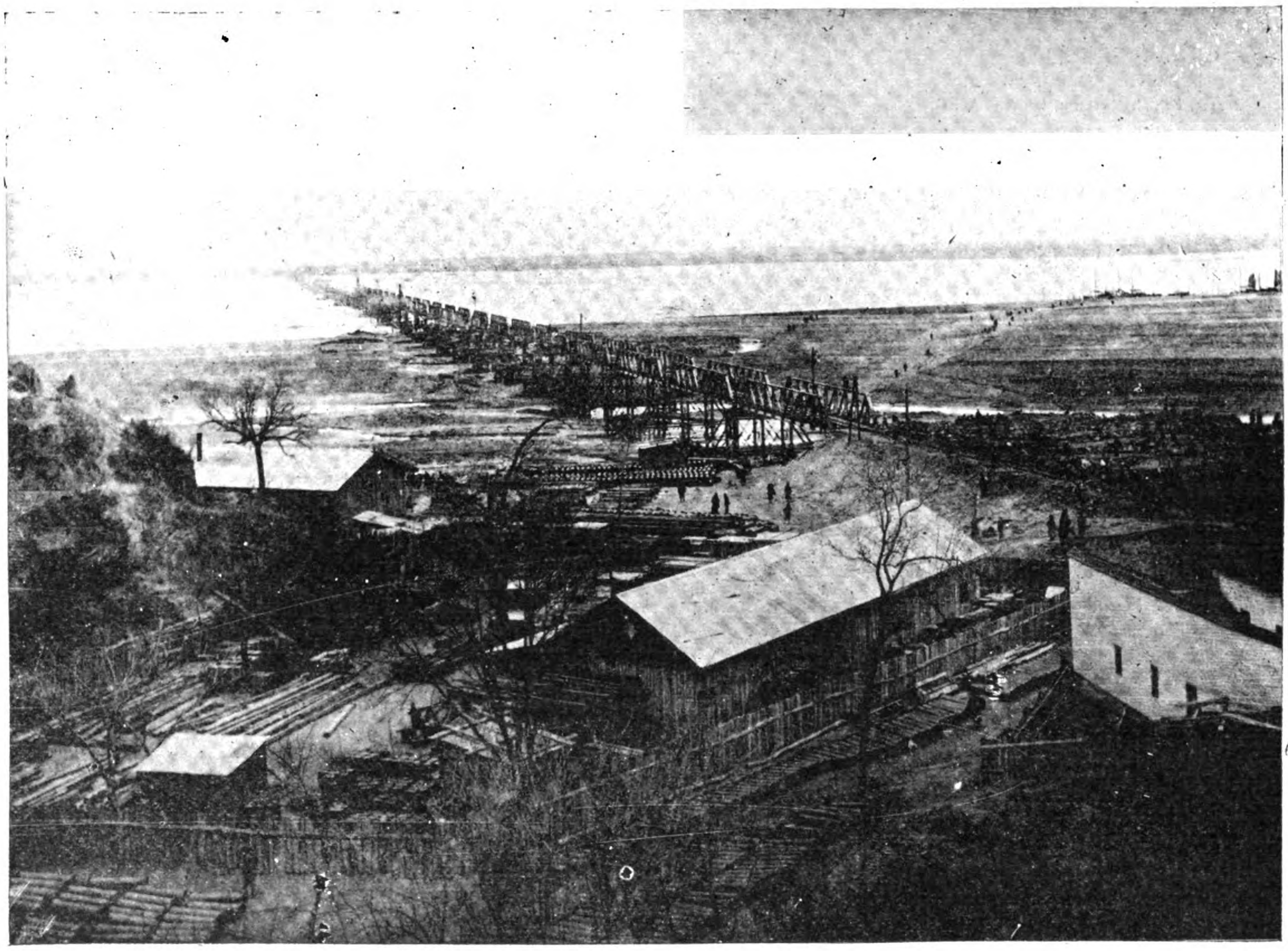
CONSTRUCTION OF THE PEKING AND HANKOW RAILWAY BY THE FRANCO-BELGIAN SYNDICATE

Of all the enterprises in China in which Belgian capital has taken a share, the most important is certainly the Peking-Hankow (Lu-Han) Railroad.

This immense line is 1,200 kilometers long and constitutes, with its future extension from Hankow to Canton, the Great Central Railway of China, which will one day form the trunk line of all the other railroads of Central China, and which will link the Gulf of Pechili with the Gulf of Tong-King—2,500 kilometers—passing through Hankow, the largest port of the Yangtsze Blue River, which is situated at the junction of this waterway and the Han River.

The Hankow-Wuchang-Hanyang agglomeration—the knot of the entire Chinese system of railroads—had formerly 6,000,000 inhabitants, but there remain now no more than 2,000,000 since the terrible Taiping Rebellion which desolated this region. Owing to her unique location on one of the finest rivers of the world, in the center of a valley with a population of 100,000,000 people, nothing, however, should prevent Hankow from returning to her ancient importance as a trade center. The same may be said of other cities as railroads replace the almost extinct imperial highways and the obstructed canals.

On the N., the Great Central Railway of China will connect, *via* the Imperial Railways of North China, with the Manchurian and Transsiberian systems; on the S., by means of the Lan-son and projected Nanning lines, with the French Indo-China system. The idea of a railway traversing all the provinces of Central China had, since sometime ago, been the essential subject of all China theories concerning railroads.



GREAT STEEL BRIDGE ACROSS THE HWANG-HO, OR YELLOW RIVER

PROJECT FORMULATED.—In 1889, Chang-Chih-Tung, then Governor of Canton, formulated a clear project in a report to the emperor at Peking. His proposals were considered as most valuable and an imperial decree sent Chang to the viceroyalty of the Two Hus, of which the capital (Wuchang) and Hankow face each other on opposite sides of the Yangtsze. His special mission was to preside over the construction of the southern portion of the Peking-Hankow line, while Li-Hung-

(*Continued on page 146*)

THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.

PUBLISHER AND EDITOR

COMMERCE :: ENGINEERING :: FINANCE

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MANILA, SHANGHAI AND YOKOHAMA, OCTOBER 1906

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HONGKONG'S METEOROLOGICAL SERVICE.

Anent the destructive typhoon which recently visited Hongkong, the newspapers of that colony have been discussing with more or less vehemence its meteorological service. Failure by the observatory to give timely warning of the approaching storm to shipping and other harbor interests, has resulted in charges of gross negligence against Director W. Doberck, with the result that the Governor of Hongkong feels himself called upon, in the interest of the colony, to institute a searching investigation into the conduct of the observatory. During all the controversy, in which the observatory management seems to appear in a most unenviable light, it should be a matter of self-congratulation for the Philippine Government and the reverend director of the local Weather Bureau, that the Manila Observatory and its management come in for high praise from the seat of the trouble. And while we have no desire to take part in the discussion, we deeply regret the final decision of the Rev. José Algué, S. J., Director of the Philippine Weather Bureau, not to publish an extensive report of the typhoon in his official bulletin for September. The identity of this storm with the one which crossed the Philippines a few days earlier, may be pointed out by Father Algué; but in view of the animosity which has always been displayed by Mr. Doberck against the Manila Observatory, and his antagonistic attitude thereto, the reverend director has no desire to embitter him still more by pointing out what might have been done in line of timely forewarning of the Hongkong disaster. Furthermore, a thorough discussion of the subject could not be accomplished at the Manila Observatory without access to Mr. Doberck's records, which privilege Father Algué might not hope to be accorded on account of the one-sided animosity which restrains professional and scientific freedom of communication between the two institutions. We should like to see the barrier of jealousy so long existing torn away, because we believe that with earnest and unselfish coöperation between the observatories of Manila and Hongkong much good could be accomplished in the public interest.

HON. W. MORGAN SHUSTER

Mr. W. Morgan Shuster (see illustration on page 167) has taken his seat as a member of the United States Philippine Commission, under appointment by President Roosevelt, and has entered upon his cabinet duties as Secretary of Public Instruction. In the promotion of Mr. Shuster from the office of Insular Collector of Customs, the faithful and efficient services of a highly esteemed servant of the Government have been rewarded. At the head of the Bureau of Customs, Mr. Shuster discharged his onerous duties with signal ability, and although he was repeatedly criticized for his strict and impartial construction of the customs laws, at no time was it ever hinted at that he lacked integrity or honesty. During his official career in the Philippines he has made himself beloved by the Filipinos, to the extent that when he announced to his native friends his candidacy for a seat on the Commission they rallied to his support to a man. To this friendship, so wisely cultivated for several years, Mr. Shuster owes his promotion in large degree.

The commissioner begins his new duties with the hearty good will and earnest support of all classes and nationalities. This fact was clearly demonstrated at a popular banquet given in Manila, on the evening of October 12th, in his honor, which was one of the largest and most cosmopolitan entertainment of its kind since American occupation. The trend of the addresses on that occasion was deep concern for the commercial, industrial and agricultural rejuvenation of the Philippines; and Mr. Shuster's remarks along these lines were vigorous, pointed, and sincere. Being by several years the youngest member of the Commission, we expect from him like vigorous and sincere work in the department he now conducts. The merchants of Manila, in particular, are to be congratulated on his appointment because we believe that in Mr. Shuster they have another aggressive Commissioner who will make their interests his special concern. We congratulate both Mr. Shuster and the business interests on his promotion. We believe his career as Commissioner will be far more brilliant than his administration of the customs, if the enthusiasm of young manhood and a brilliant, well-trained mind count for anything.

TRADE OF SHANGHAI, 1905.

According to a report emanating from the British China Consular Service, recently published, the gross tráde of the Port of Shanghai during 1905 amounted to £66,795,116 as against £58,008,150 in 1904 and £44,237,049 in 1901. The net value of trade, *i. e.*, foreign and native imports, less re-exports, and native exports of local origin, was £26,619,440 in 1905 as against £20,444,328 in 1904 and £17,567,351 in 1901. The total import, including re-exports, of foreign goods; and the total exports, including re-exports, of native produce to foreign countries were £55,101,652 as against £46,562,745 in 1904 and £35.549,834 in 1901.

The year under review was an exceptional one, the trade and general conditions of the port having been influenced by several unusual causes, such as the boycott, the typhoon of September 1st which caused a loss of millions of dollars to heavy stocks in godowns or warehouses; and absence of trade in the north on account of the Russo-Japanese War, etc. In spite of these adverse influences, the trade of Shanghai shows a healthy increase over that of 1904, and everything seems to point to an ever-increasing prosperity there. With the exception of 1903, there has been a steady increase since 1901; and to go back 10 yrs., the figures of 1905 are about double those of 1895. The marked and continued increase in the trade of the port shown by these figures speaks volumes for the commercial prosperity of Shanghai, and indeed the whole of China, for the trade of Shanghai is chiefly that of a re-distributing center for imports and a port of re-shipment for exports.

The imports of metals of various kinds also shows an increase in copper, iron and steel of all sorts, especially in galvanized-iron sheeting. Lead alone shows a falling off. The import of copper ingots was 205,749 cwts. as against 61,397 in 1904; iron and steel angles, nail rods, etc., nails, sheets and plates, galvanized iron sheets and plates, pig and bar lead, and zinc, 412,052 cwts. as against 139,901 in 1904. The import of hardware amounted to £38,211 as against £22,883 in 1904; of machinery, to £96,498 as against £85,422; of kerosene, to 35,489,571 galls. as against 28,912,554; of engine oil, 938,909 galls. as against 182,559; of hard timber, 1,032,724 cu. ft. (decrease) as against 1,189 917; of soft timber, 19,489,186 sq. ft (decrease) as against 23,784,216 in 1904.

Ten thousand, two hundred sixty-five vessel representing a total tonnage of 14,344,162 entered and cleared the Port of Shanghai during 1905 as compared with 9,434 vessels with a total tonnage of 12,181,798 in 1904. Of the figures for 1905, 9,139 vessels (14,125,919 tons) were steamers and 1,126 (218,243 tons) sailing ships. Of the former the British led the list with 4,363 (7,114,248 tons), and next in order came Chinese, German and Norwegian vessels.

CIGAR-BOX INDUSTRY

In a recent communication to the Secretary of the Interior of the Government of the Philippine Islands, Major George P. Ahern, U. S. Army, Director of Forestry, makes public some interesting facts covering discrimination against the local cigar-box industry in favor of European manufacturers.

European cigar-box makers send to Cuba and Central America for cedar, which is shipped

in the log and sold in Europe, including freight; duties, etc., at 220 to 250 francs per cu. met., which is about ₱2.37 to ₱2.70 Philippine currency, per English cu. ft. This material is worked up into boards, ready to put together into cigar-boxes, at approximately the following prices per 100 boxes:—₱6.38, ₱6.51 and ₱ 7.41, according to size of boxes. These are prices quoted to a former forester of Major Ahern's bureau, who was in Europe at the time the figures were given.

To the large importers a lower figure is quoted. A single shipment of 47,500 cigar boxes was received from Germany this year by a Manila cigar factory. The invoice gave the following figures:—

47,500 cigar-boxes (average cost per 100 boxes, ₱5.80)	₱2,799.67
Freight to Manila	304.48
Insurance	20.74
Commission	78.08
Unloading at Manila	60.15
Import duties (at ₱1.50 per c. m.; present Government charge on Philippine cedar, *calantas*, in Cagayan, Mindoro and Moro provinces)	34.54
Brokerage	61.23
Total	₱3,358.89
Average cost per 100 boxes	₱ 7.07
Cost of putting boxes together	1.00
Total cost per 100 boxes	₱ 8.07

The Philippine wood known as *calantas* makes a good cigar-box wood and it should be used to the exclusion of Cuban or Central America cedar. It seems strange that Cuban cedar can be carried to Germany and sold there at from ₱2.37 to ₱2.70 per English cu. ft., then made up into boxes, shipped to Manila, paying freight, duties, insurance, brokerage and lighterage, and sold cheaper than cigar boxes made in Manila of practically the same wood. The import duties form a small item in the cost, but that sum is exactly the full Government charge on *calantas*. The Manila price of *calantas* is approximately ₱0.90 per English cu. ft., much less than half the cost of the Cuban cedar in Germany.

Calantas is usually brought from Cagayan, Mindoro and Moro, although it is found in many other provinces. The price for *calantas* has not changed to any extent during the past 4 or 5 yrs. It remains at about ₱0.70 per Spanish cu. ft., or about ₱0.90 per English cu. ft. Although the Government charge on this wood was reduced in May, 1904, from 14 to 5½ *centavos* per Spanish cu. ft., in the above-named provinces, the market price was not affected. The men in the woods and the consumer received no benefit from the reduction. The cost of getting a cubic foot (Spanish) of *calantas* from the Cagayan Valley to Manila is about as follows:—

Cutting and hauling to water	₱ 0.15
Transportation to ship	0.04
Freight to Manila	0.30
Government charges	0.05½
Unloading	0.02
Total	₱ 0.56½

Dealers in Manila sell the wood in the log, as heretofore stated, for about ₱0.70 per Spanish cu. ft., or ₱0.90 per English cu. ft. The lumber is sold at about ₱180 per 1,000 b. m. A few of the Manila sawmill men have made cigar boxes—Barretto & Co., Tuason and Sampedro—and sell them from ₱11 to ₱15 per 100. The German factories turn them out at a profit for ₱5.80 per 100. Barretto & Co., Manila, find that the business is not remunerative at ₱11 to ₱15, and are not making any more boxes.

The difficulty lies in the method of manufacture. Skilled labor may be obtained in Manila at a comparatively low wage. The Filipinos are very apt in learning how to handle new machines. With modern cigar-box machinery in Manila boxes should be turned out at the lowest figure above quoted, or approximately ₱6 per 100.

A petition from the municipal presidents in the Province of Cagayan requests that *calantas* be taken from the second group and placed in the third group, thereby reducing the Government charges on this wood about ₱0.01½ per cu. ft. However, if the reduction from 14 to 5½ *centavos*, made in May, 1904, made no change in the market price of *calantas* nor in the quantity of timber delivered in Manila, it is probable that a further reduction of ₱0.01½ will fail to bring about the results desired by the municipal presidents. In Spanish times, *calantas* was placed in the first group and a charge of 5 *centavos* per cu. ft. imposed on such wood coming from Cagayan and Mindoro. In May, 1904, at the solicitation of a number of people, this wood was placed in the second group by the Director of Forestry, yet, as stated before, the market price of the wood in the log and manufactured into lumber remained the same.

In order to foster, therefore, the cigar-box industry, in the event that modern machines are introduced, Major Ahern recommends that the Government charges on *calantas* used for such purposes be not imposed for 5 yrs. Without the introduction of modern machines, a reduction of ₱0.01½ per cu. ft. would not of itself revive the industry.

Some statistics have been secured from the Bureau of Internal Revenue which show about the number of cigar-boxes consumed in the Philippines *per annum* and give a good idea of what could be accomplished in the cigar-box industry were it to be revived on a basis where it could compete with the foreign factories. They follow:—

Cigars manufactured in the Philippine Islands during the fiscal year ended June 30th, 1906:—

Consumed in the Philippine Islands	80,000,000
Exported (of which about 40,000,000 were very small cigars used in the China trade)	94,341,542
Total	174,341,542
	40,000,000
	134,341,542
Many cigars are sold in bundles and not boxed, say	14,341,542
Total number of cigars boxed about	120,000,000

Averaging 40 cigars to a box, 3,000,000 boxes would be required, according to these figures.

A very small number of boxes are made in Manila and a very large number of boxes are used more than once by the Chinese.

About 1,500,000 boxes are imported from Europe each year.

Twenty-one hundred boxes require 1 cu. met. of boards in their manufacture, 2,100,000 boxes require 1,000 cu. met. of boards, or 35,000 cu. ft., or 420,000′ b. m. This could be secured from 50,000 cu. ft. in the log if sawed economically. A tree 30″ in diameter with 50′ clear length, should furnish over 2,000′ b. m. Two hundred and ten such trees would supply material enough for more than 2,000,000 boxes. Seven thousand boxes per day for 360 days would be required to supply such a demand.

We believe that Major Ahern's conclusions should prompt local capital, with his assistance, to establish a modern cigar-box manufactory in Manila and thus keep all the benefits accruing from the industry at home.

YUNNAN RAILWAY

An account has been received from H. B. M. Consul at Hanoi (Mr. T. Ff. Carlisle) of a journey recently made by him from Hanoi to Yunnan-fu. The railway from Yenbay to Laokay was opened to public traffic on Feb. 1st last, putting thereby the frontier of Yunnan into railway communication with Haiphong. After reaching Laokay, Mr. Carlisle proceeded along the Nam Ti Valley to Mengtsze, which is the course followed by the Indo-Chinese railway, and continued along the route of the Railway to Yunnan-fu. On his return he took the route *via* Manhao and the Red River, which has been the usual route for travellers between Tong-King and Yunnan. This, he says, will doubtless be gradually abandoned in favour of the Nam Ti Route as the railway advances along the latter. Mr. Carlisle makes the following general observations on his journey:—

The consensus of opinion seems to be that the line will probably be completed for traffic in three or four years. When it is opened I fully anticipate that it will carry a considerable import into Yunnan of goods from Hongkong. Foreign goods in transit through Tong-King have to pay only 20 per cent. of the French General Tariff. In addition to this they would have to pay, of course, the Chinese import duties. But even granting that the districts of Yunnan lying south of the capital receive the bulk of their foreign imports by way of the railway, will such trade be sufficient to make the latter pay in view of what it will have cost by the time it is finished? Local French opinion seems now to doubt it, and to hold that railway connection between Yunnan-fu and Szechuan will have to be provided somehow to give sufficient traffic to the Haiphong-Yunnan-fu line. If one regarded the actual course of the railway line, one would have little hesitation in coming to this conclusion also. The portion from Laokay to Mengtsze (164 kilometers) contains no promise of future trade whatever. From Mengtsze northwards the prospect is considerably brighter. But still a great part of the course of the railway lies through unproductive country, such as the narrow valleys and gorges of the Boi Ta Ho..... Had I left Yunnan having seen only the course of line, I should, have gone away with the impression that it was a country too poor to make it worth while to build railways in it. But my return journey by the route on the west of the *trace* showed me that there was a considerable population there within easy reach of the line, and I understand that there is a similar belt on the east. Between these two regions and with the country immediately on its route, together with the more remote parts of the province, which are sure to contribute a certain amount of traffic in time, there should be enough business for the railway, provided that the French Custom House and railway officials do not hamper traffic with heavy duties and freights and vexatious regulations. I still do not regard Yunnan as a rich country, but, of course, I have only seen a portion of it. I believe that Monsieur Lantenois, "Chef de Service des Mines" in the Public Works Department of Indo-China, has expressed an opinion unfavorable to the idea of the great value of Yunnanese mines. (The tin of Ko Chiu is, of course, a valuable asset.) Whether or not there is enough wealth in the province to make the Yunnan Railway a financial success, I have no doubt that there is enough to purchase a considerable quantity of foreign goods when they can be brought up by train in two or three days' journey from Haiphong instead of having to submit to the cost and risks of the long voyage overland or by the Red River. I make no doubt, too, that a large proportion of the goods will be of British origin and imported from Hongkong.

NEW GARDEN BRIDGE, SHANGHAI

Previous to 1870 those residents of Shanghai whose business took them to and fro between the Bund and Hongkew had to cross the Soochow Creek in a ferry. In 1871 an iron bridge with a "draw" span was erected by the Soochow Bridge Company. It was not a success, as it collapsed before being opened to traffic owing to the settlement of the screw pile foundations. The present wooden structure was built in 1873, but the bridge was widened, and practically rebuilt, in 1890. Some time ago it was decided to rebuild the bridge, and after considering various plans and seeking the advice of Mr. Jean de Rijke, the Council decided upon a two-span bridge. The bridge in course of erection, therefore, will consist of two spans of 170 feet each, and will be 60 wide over all—twenty feet wider than the present bridge. This extra width will necessitate the moving of the Margary Memorial a little west of its present position, and the inclusion of a small portion of the ground at present used for Municipal green-houses. The new road level will be somewhat higher than at present, in order to provide an improved headway for the creek traffic, and to allow sufficient depth for the floor beams. The abutments and pier are to be constructed of Portland cement concrete, with Soochow granite dressings. It is for these that coffer-dams are now in the process of construction. Borings have recently been taken, which show that, for a depth of at least 200 feet, the soil is an alluvial deposit of a highly micacious nature. The carriage way of the new bridge will be paved with hardwood blocks, and will carry two tramcar tracks.—*North China Daily News.*

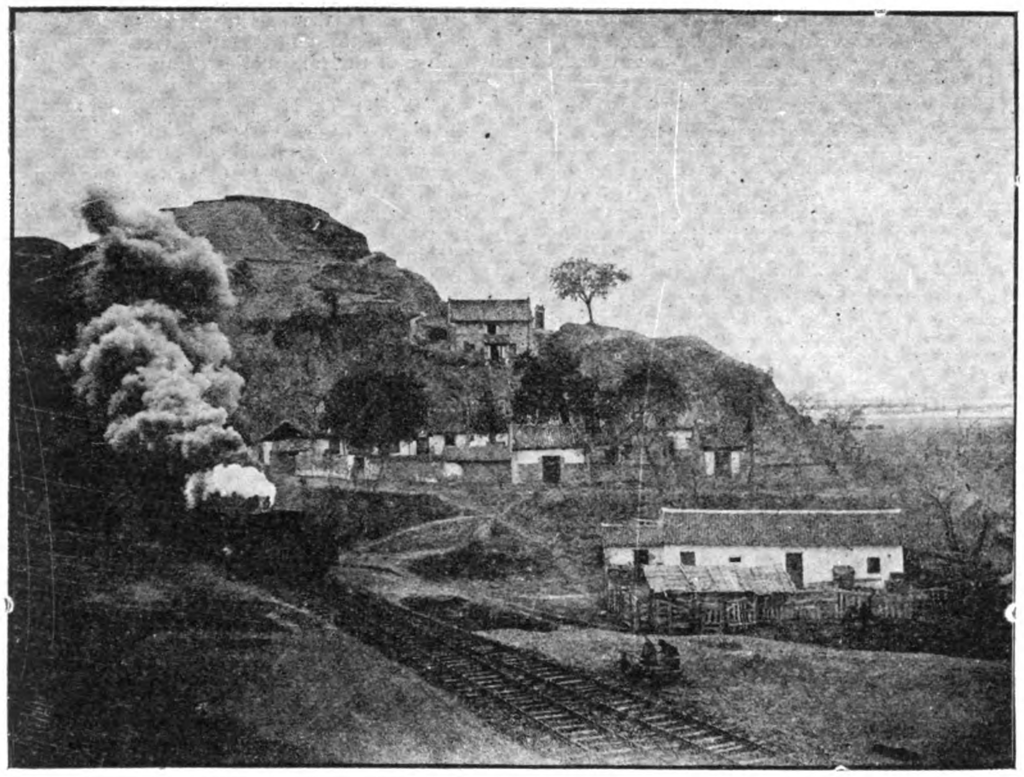
CONSTRUCTION OF THE PEKING AND HANKOW RAILWAY BY THE FRANCO-BELGIAN SYNDICATE

(Continued from page 143.)

Chang, then Viceroy of the Province of Pechili, was looking after the final construction of the road in its northern portion. Chang-Chih-Tung must have on this occasion felt very keenly the great difference there is between the completion of a colossal undertaking and its execution. Years passed by, and the clever viceroy saw no possibility whatever of how to carry out his stupendous project. He knew well that the creation of such a railroad had, besides its economic conclusions, a very great political complexion. He knew that if China wished to prevent foreigners from possessing a new and dangerous weapon, she must construct her future railroad absolutely with her own resources. But to do this money was necessary, and it was impossible to obtain money in China.

BELGIAN AND FRENCH CAPITAL NEGOTIATED.—About the end of 1896, Chang and Li caused the Sung-li-Yamen to understand that the latter had much miscalculated the resources of China when it proposed that this national enterprise should be carried out without the help of foreign money. The two promoters of the project received authority to grant the concession to a company of the "most favored country." They communicated first with the United States. Chang thought that the United States had no special political design upon China; but the exaggerated pretensions of the American capitalists towards the concession compelled the promoters to seek elsewhere less onerous conditions. They then turned towards Belgium, "a very wealthy, small country, whose power is negligible," as they said in their report of December, 1897. They chose this country, guided by the above political considerations.

On another side, while the negotiations were taking place, M. Gérard, minister for France at Peking, thought the moment had come to remind the Sung li-Yamen about Article 7 of the Franco-Chinese Treaty of June 9, 1885, which stipulates that "in the construction of railroads, China will use all her influence to attract French industry." The political power of France was, for the Belgians, a precious auxiliary to protect, when necessary, their involved interests. The result was, therefore, a fusion of Belgian and French capital in one company.



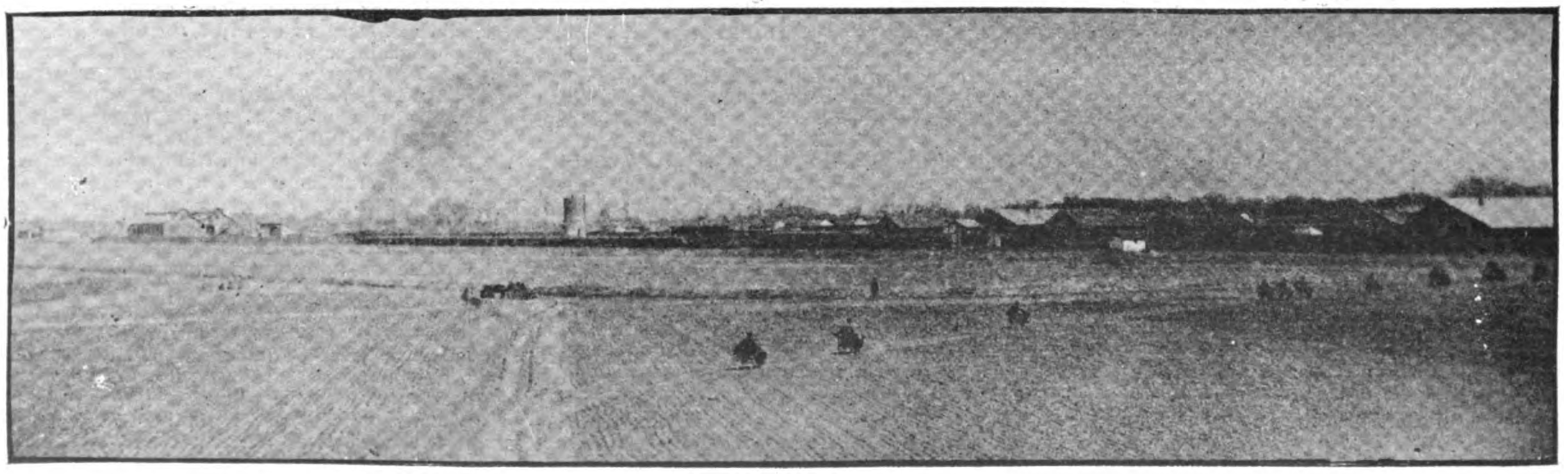
SOUTH TUNNEL ENTRANCE TO THE YELLOW RIVER BRIDGE

Since 1897, a preliminary contract had been signed between the Chinese Government and the Franco-Belgian Syndicate for the construction of the railroad, and on June 26th, 1898, despite a rather strong opposition from Great Britain, the Belgian minister at Peking, M. Joostens, obtained the definite concession of the road for the *Société d'études de chemins de fer en Chine.*

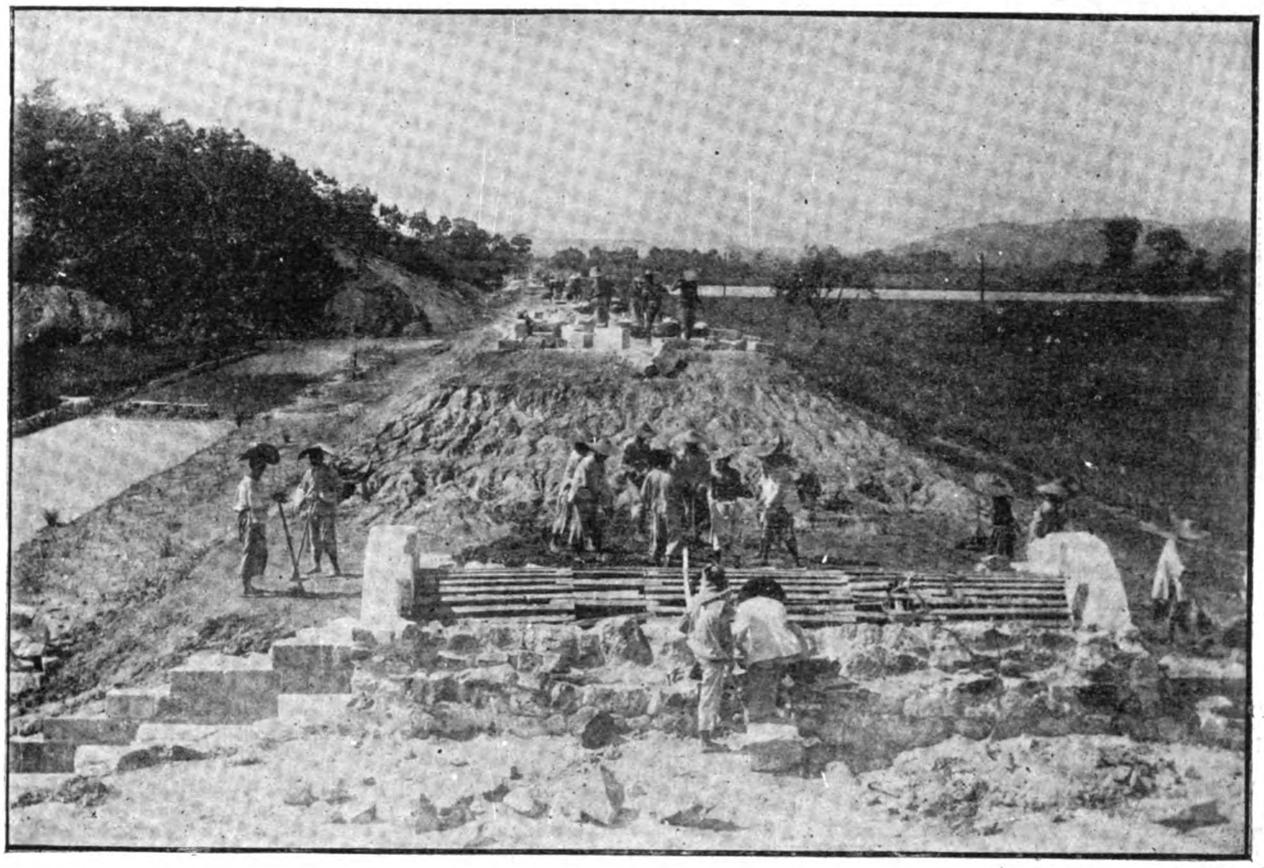
PROVISIONS OF THE CONTRACT.—In this connection it might interest the readers to know the nature of the contract that linked the Sung-li-Yamen to the Franco-Belgian Syndicate just mentioned. The Manchurian system of railroads had been built by a Russian company, and the German system by a German company. Both of these companies had been created at the risks and perils of the concessionaries, without any guarantee from the Chinese Government. It was altogether different with the concession granted to the Franco-Belgian Syndicate, which obtained not only the support of Chinese Imperial Company of Railroads, conducted by Chang, but also the official patronage of the Peking Government, which gave it financial support by working out the following combination:—

In order to facilitate the operations of the contracting company, China decided to issue a state loan. The specifications having been accepted and the amount to be spent approved by competent authority, the Chinese Government remitted to the syndicate bonds at 90 per cent sufficient to cover the expenditures decided upon. The syndicate had only to negotiate these bonds. The money obtained by this operation constituted the capital with which to build the road for the Peking Government, the contracting syndicate receiving as remuneration for its trouble 20 per cent of the net profits of its undertaking. Such was the ingenious mechanism which served as a basis for the convention concluded, in 1898, between the Chinese Imperial Company of Railroads and the syndicate. It presented this considerable advantage that the concessionaries had, in reality, not to trouble themselves about the formation of a construction capital; they had only to secure sufficient credit in order to convert into money their Chinese paper. It was thus that in March, 1899, a loan amounting nominally to 112,500,000 francs, called the 5 per cent Chinese Loan of 1898, was issued at the same time at Brussels and in Paris. The transaction seemed even then so brilliant that the loan, in Paris alone, was covered ten times over.

SURVEYS AND COMMENCEMENT OF CONSTRUCTION.—While the negotiations were going on, Chang Chih-Tung had already had the first surveys and drawings made. The road, for a short distance from Hankow, goes along the Yangtsze, then traverses



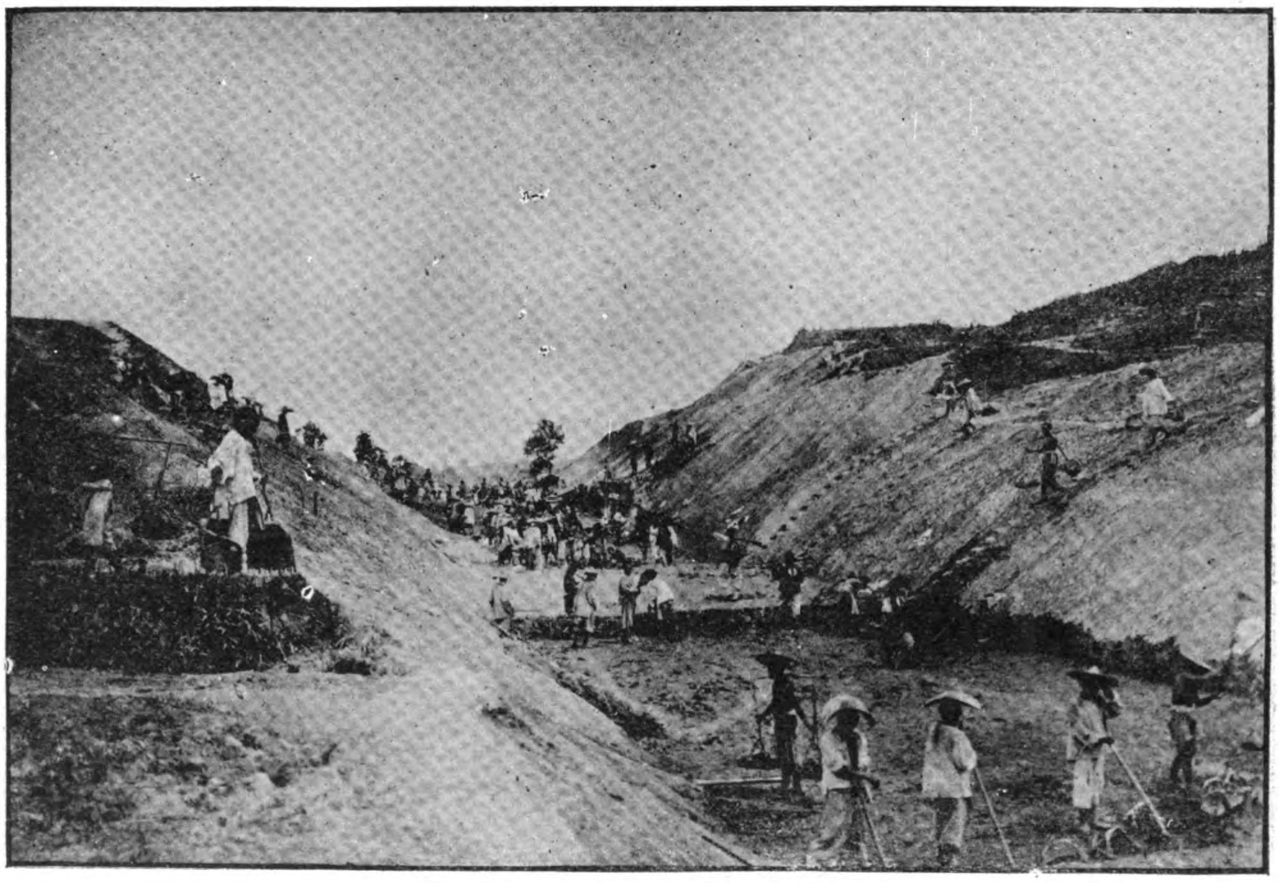
COMPANY'S CENTRAL SHOPS AND HEADQUARTERS AT CHANG-SIN-TIEN



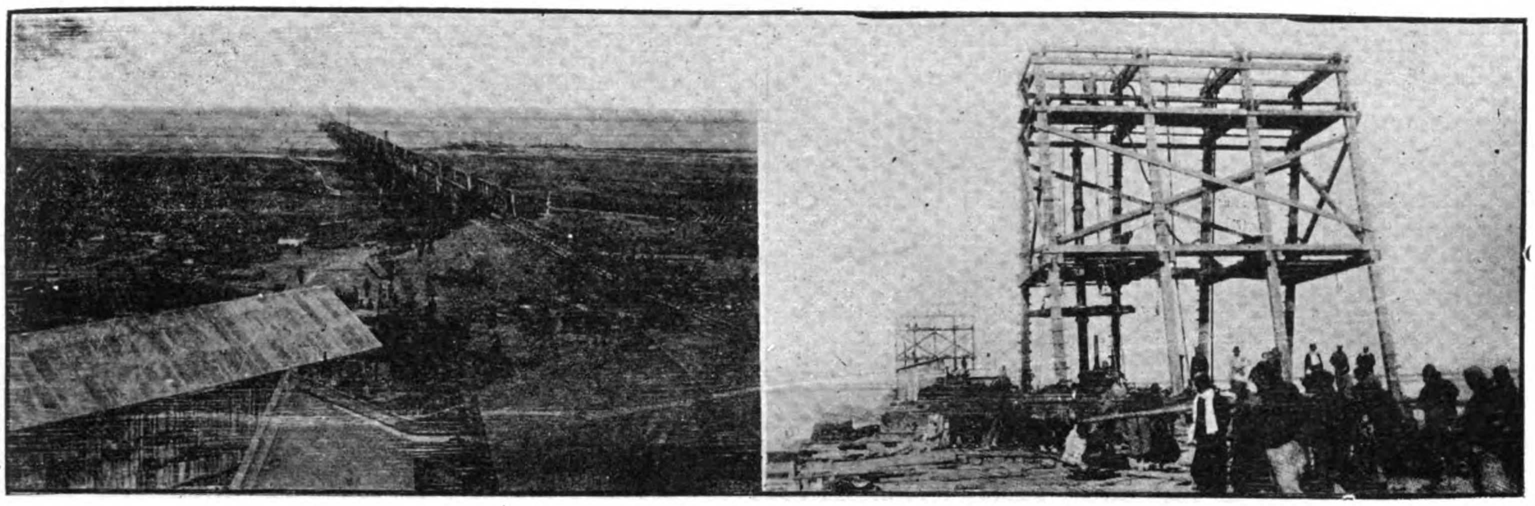
EARLY STAGE OF ROADBED CONSTRUCTION

the Hu-pei Plain. From Honan-Chau—at the 153d kilometer post—the line zigzags between steep hills forming scenery to be compared with the finest Japanese landscapes. After Sinyang, it traverses another charming plain, a little before reaching the Hwang-ho (Yellow River), where is erected on the summit of a hill a temple concentrated to the divinity of the river.

Work was begun in 1899, simultaneously on the Peking terminus and on that of Hankow. It was very actively carried on under the direction of the efficient Belgian engineer, M. Jean Jadot, as chief engineer of the Pei-Han. In this year quays and workshops were constructed, and rolling stock, materials, etc., for construction purposes, were purchased and received. It was necessary to build a great number of bridges, some of which reach a height of 420 meters. Though the work was interrupted for nearly a year—during the



ONE OF THE DEEPEST CUTS ALONG THE RIGHT-OF-WAY



GIRDER CONSTRUCTION AND SINKING SCREW-DRIVEN TUBULAR PILES FOR YELLOW RIVER BRIDGE

Boxer trouble of 1900—and though the buildings were partly destroyed, the concessionaries succeeded in building in the same year 90 kilometers of line on the Hankow section.

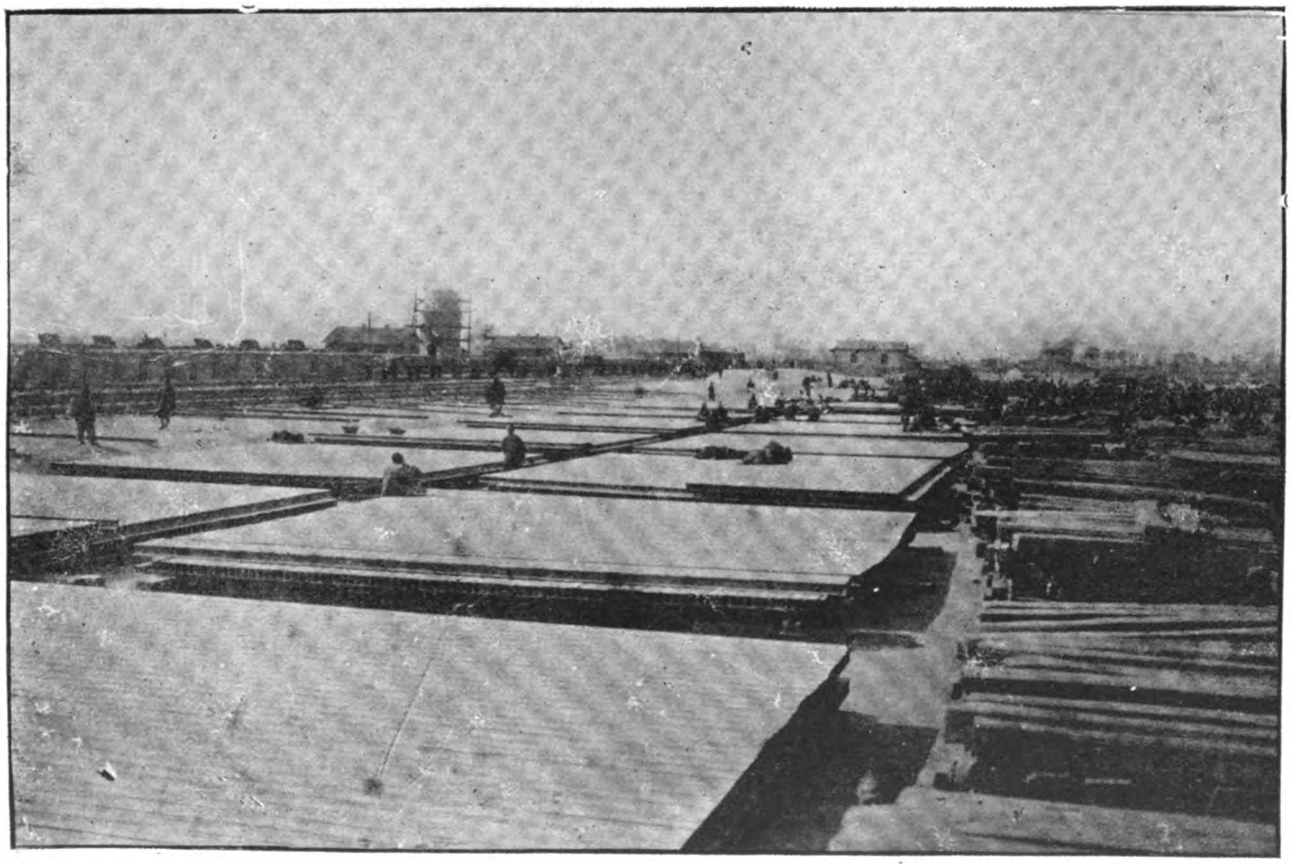
In 1901, great damage by inundation was done to the embankments between the Chinese City and the river railroad station; when the wind blew hard, the waves swept even the embankments. As this part of the road is more or less inundated every year, in summer, during the rise of the Yangtsze River, it was necessary to cover with stone the N. slope of the embankment so as to avoid annual repairs. This great work was completed at the beginning of 1902.

At Hankow, at the river railroad station, vast workshops and sheds were erected. A quay of 4,800 meters had been built all along the river, and vessels of deep draught can now come alongside. The maintenance of the quay is very costly, as the current gnaws at and mines the river, and forcing, therefore, the use of immense quantities of rock to resist its action.

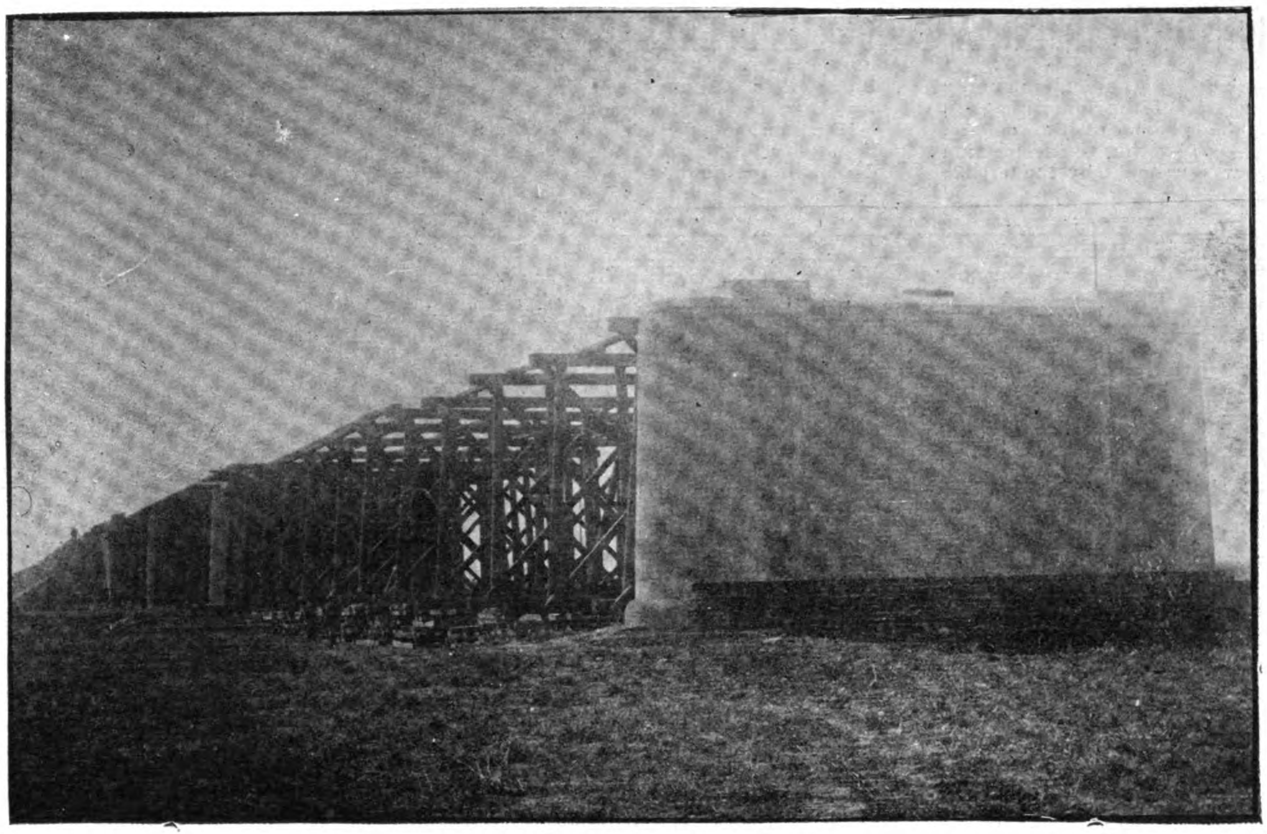
Notwithstanding the inundations, and before the end of 1901, the road was opened on the Hankow side, and its distance was 153 kilometers. There was first a weekly service from both ways, but, since the beginning of 1902, three trains weekly were needed.

At the 155th kilometer, the road traverses the line which divides the basins of the Yangtsze and Hwang-Ho rivers over a height of 200 meters. It was necessary to cut the rock through a length of 20 kilometers, and to get beyond the summit a tunnel of 350 meters had to be pierced, wide enough to allow the laying of a double track. This difficult engineering work was completed in August, 1902, and thus allowed the traffic up to Sinyang, at the 218th kilometer post. The same year saw the inauguration of a daily train service between Hankow and Sinyang, as well as the installation of a second station at Hankow, in the French Concession. In the spring of 1903, a third station was opened at Hankow, on the Han River, quite close to the wall of the Chinese City. On January 1st, 1904, the road was opened up to the 313th kilometer post at Chau-Ma-Tien. This is the terminus in the N. of the Hankow section. It is at this station where ends the immense Northern Plain and where begin the ramifications of the hills which form more southerly the boundaries of Honan and Hu-Pei. Some of the slopes are steep, and there it is necessary to add more locomotives to the trains. The heavy trains coming from the N. are transformed into light ones at Chou-Ma-Tien for the Hu-Pei and the Yangtsze, and *vice versa*.

GREAT YELLOW RIVER BRIDGE.—At the beginning of December, 1904, on the Hankow side, rails were laid up to the Hwang-Ho River—500 kilometers. Across this waterway the gigantic Hwang-Ho River bridge has been constructed. This structure is 3010 metres long. The construction of this bridge was a unique feat in engineering and one on which the eyes of the engineering world was earnestly fixed. It is about 6.25 meters above high-water level, and is of steel throughout,



MILLIONS OF TONS OF MATERIAL UTILIZED FOR RAIL AND BRIDGE WORK



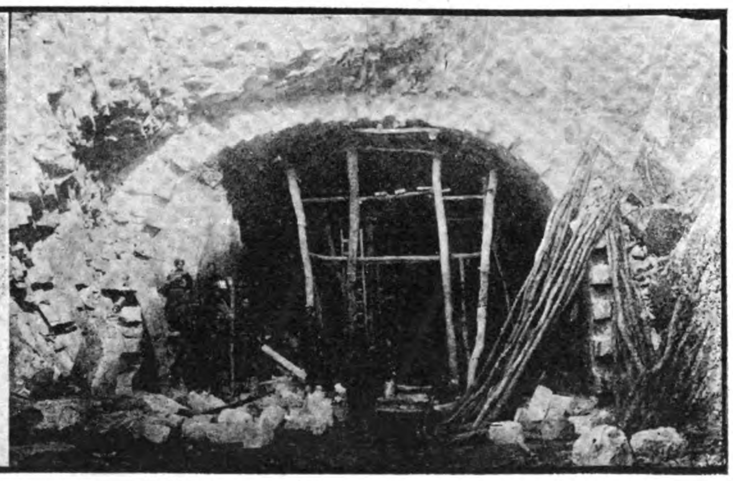
GENERAL TYPE OF PIER CONSTRUCTION

the massive girders being supported on sets of screwdriven tubular piles. The steel piles were screwed into the bed of the river by means of hand capstans manned by squads of coolies. In fact all bridges are of steel and like construction, while the approaches and other masonry work are of concrete. The bottom end of each pile has a tooth point with a large inclined blade above it, not unlike the tip of a corkscrew. To each point was clamped an enormous grooved pulley, around which was wound a wire hawser. One end was led to one of the capstans, and then the coolies heaved away and the work of screwing began. The rotary motion of the piles, with the corkscrew blade, naturally screwed the pile down into the mud till the pulley was level with the platform on which the workmen were standing. When the pulley reached this platform, another length of pile was bolted together, the pulley raised to the upper flanges, and the screwing resumed. When the piles had been screwed to a sufficient depth, say 12 to 15 meters, the water was pumped out from the interior. The pile was then filled with concrete. Wooden piles were then driven around the current side of the piers in the shape of a triangle, with the points to the current, as a protection to the structure. Huge beds of tree branches, lashed together with wire, were then sunk around the steel piers, and on these beds hundreds and hundreds of tons of rock were thrown. This was reckoned to give more solidity to the river bed where the piers were driven, and possibly prevent the river washing away the foundations, if such the shifting bed of the river can be called. The steel piles were placed in sets of four, six, eight, and ten, and each pile is joined by stanchions and girders of great strength, and finally each set of piles is spanned by an enormous girder on which the rails are laid. Half of this bridge was built in France, the other half in Belgium, the work being distributed among the principal builders of the two countries.

The river bed is one gigantic quicksand and during the construction of the bridge many piles were sucked under as well as platforms supporting machinery. Breakwaters of stone have been built along the banks of the river to prevent the undermining of the bridge foundations, and either end of the structure is protected with stone-faced dykes to prevent the water washing away the dykes.

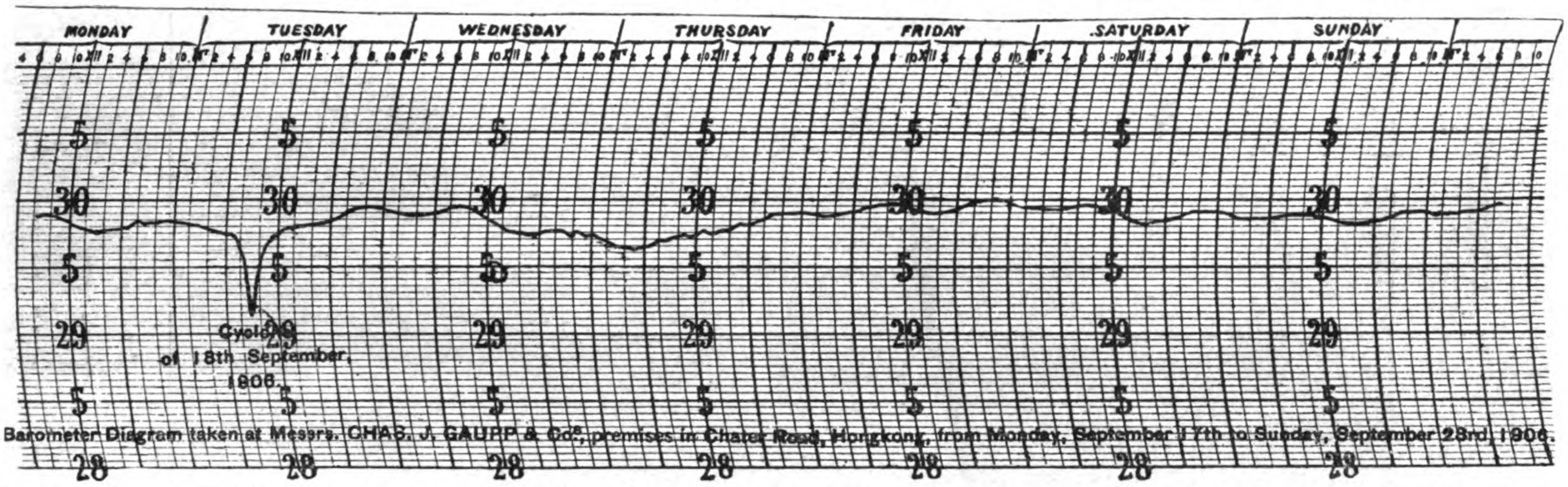
The construction of the Peking section of the line went on apace with that of the southern section, and the conjunction was formed at the Hwang-Ho River bridge. The road is now, and has been for several months, in operation through from Peking to Hankow.

ROADBED, TRACKS, GAUGE AND ROLLING STOCK.—The roadbed is well-built and solidly ballasted, over which the most powerful locomotives may work at full pressure. The gauge is the same as that prevailing in Belgium, and the rails were all submitted to a most severe test at Hanyang where they were mostly manufactured. These tests were those enforced by the Belgian Government for its railways. The weight of the rails is 37.6 kilograms per meter. The rolling stock is modern and plentiful, and some of the trains which run through from Peking to Hankow and *vice versa* are equal in appointment and speed to many similar trains on European lines. There are three classes for passengers, the cars for the 3d-class being open. The fare is about 3 cents. The rates for 1st and 2d-class are about 9 and 6 cents per kilometer.



TEMPORARY CONSTRUCTION TRACK AND TUNNEL WORK NEAR YELLOW RIVER

DESTRUCTION OF SHIPPING AND DOCK PROPERTY AT HONGKONG



With remarkable resignation and an energy that speaks eloquently of the enterprise and public spirit of the people of the colony, Hongkong is rapidly restoring the destruction and damage that was wrought by the terrible typhoon which visited that port on the morning of September 18th.

The wholesale destruction which the storm caused to shipping and harbor property has appalled the entire oriental country. Aside from the awful loss of human life, which probably never will be reliably computed, the calamity affected all classes of shipping the most. Floating craft of every description—from sampan and junk and yacht to river and sea-going vessels—were destroyed or went down in the fury of wind and wave. Wharves, piers, godowns, and shipbuilding industries were either totally wrecked or badly damaged, while most of the roads in the lower sections of the city were deluged with water and blocked by debris of every description.

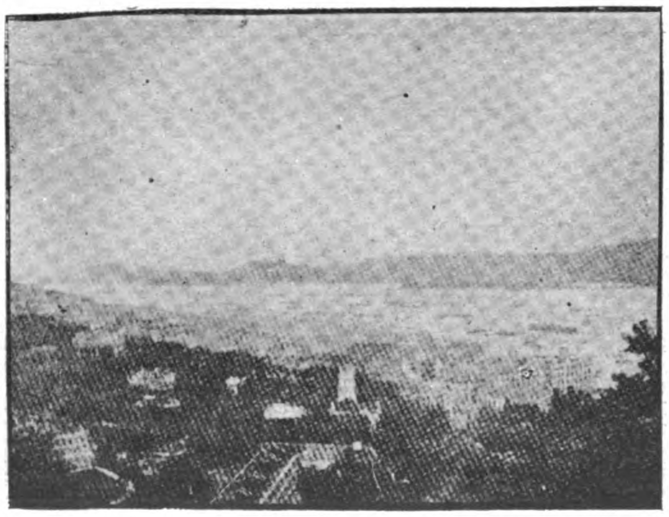
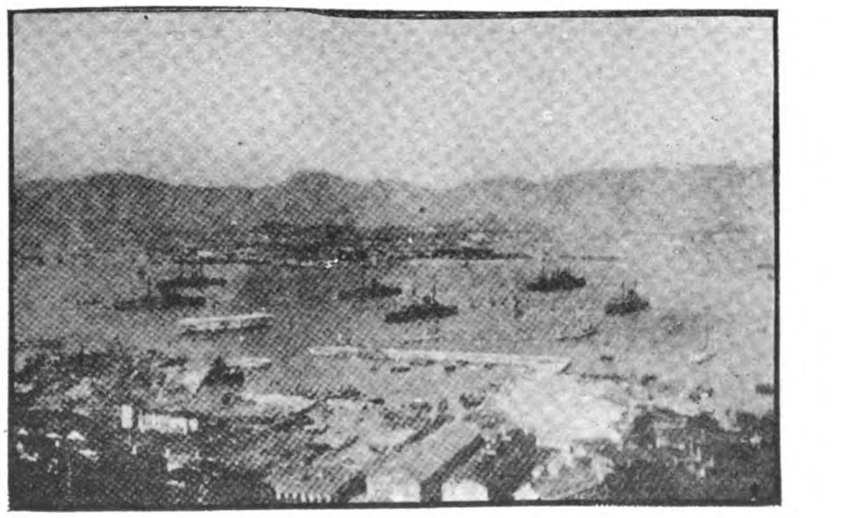
The number of water craft totally or partially wrecked is now estimated at about 1,500. Sampans and junks were smashed to pieces in the Praya Wall, where boats and wreckage were swept by the waves right on the roadway and the wreckage piled in places to the height of several feet. Opposite the Blue Buildings, against the stone pier at Observation Place, at the sugar works, on Kellett Island, and from the Navy Yard to Bowrington there was abundant evidence of the fury of the storm. At Ah King's slipway the fleets of the Royal Hongkong and Corinthian yacht clubs were almost completely destroyed, and it was here that Mr. W. H. Donald, editor of the *China Mail*, lost his $1,000 house-boat. The route to West Point along the praya was a scene of destruction and ruin, while westward from Blake Pier Connaught-rd was piled with wreckage from the harbor.

Kowloon was harder hit by the typhoon than any other part of the colony. The devastation wrought here was appalling. The full force of the gale centered upon this section. Wharves disappeared, seawalls were broken down, railway beds with masses of concrete were wrenched from the ground and crumbled up, junks and sampans were tossed upon the praya as jetsam, big ships were dragged from their moorings and tossed against the walls, others suddenly sank where they lay, and hundreds of the boat and maritime population perished.

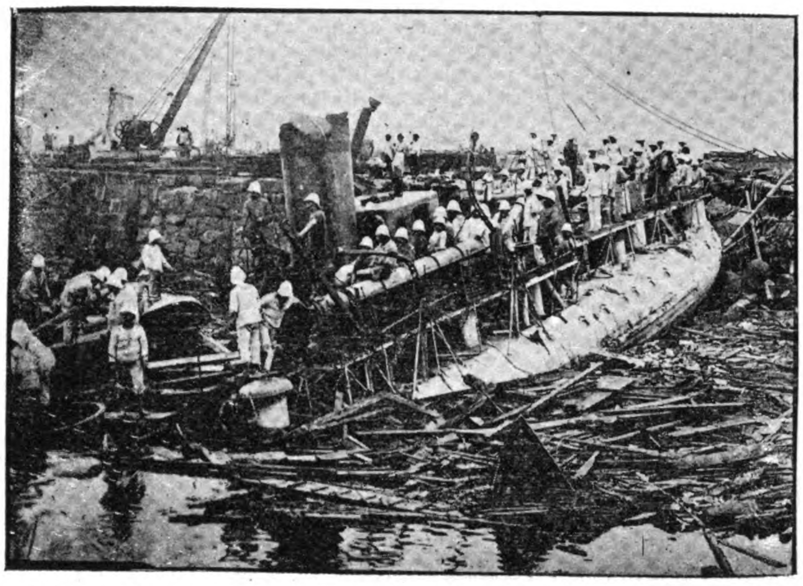
Yaumati Bay was littered with wreckage, junks and sampans lay in the streets, jetties were destroyed, and many houses collapsed, burying, it is estimated, 200 persons beneath the ruins. Seven launches of the Hongkong and Whampoa Dock Company, Ltd., were lost.

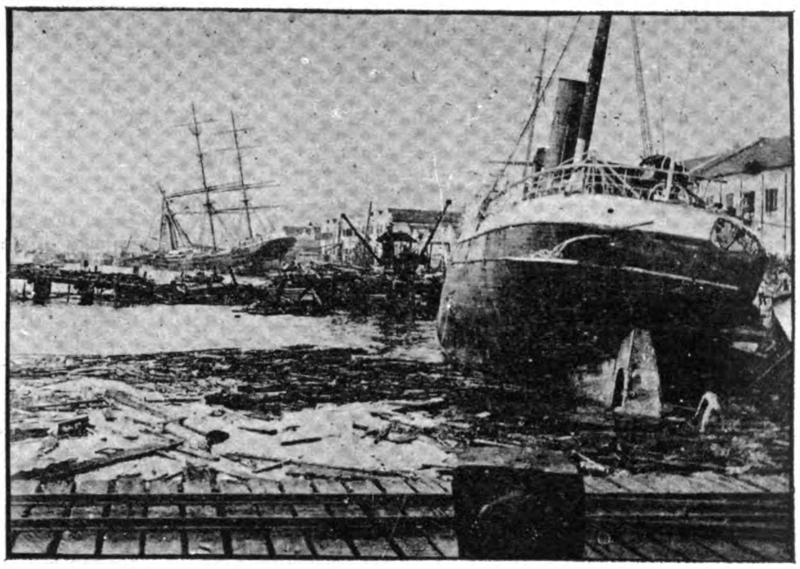
The official record of maritime losses and damage to shipping was as follows, at last account:—

BRITISH.—*Fatshan*, 1,425 tons, broke loose from buoy and after colliding with the French Mail steamer *Polynésien*, stranded in Hunghom Bay and was badly damaged; refloated on September 28th; *Monteagle*, 3953 tons, stranded N. of Torpedo Depot and stern-post and rudder stock broken; refloated on September 20th, and to be repaired at Kowloon docks; *Kwongchow*, 507 tons, sunk at Kowloon Point and nearly 400 persons lost; *Strathmore*, 2,296 tons, badly damaged in collision with steamer *Quinta*, and repairs being effected; *Wingchai*, 548 tons, ran on rocks at Samshuipo, and wreck to be sold at auction; *Kongnam*, 402 tons, sunk in Yaumati Bay; ten lives lost, including four Europeans; *Changsha*, 1,463 tons, stranded and slightly damaged at Kowloon docks; refloated on September 20th and repairs effected; *Takhing*, 395 tons, stranded at Samshuipo; salvage operations in progress; *Kinshan*, 1,092 tons, ran ashore at Tai Lam Chow Island; salvage operations in progress; *Heungshan*, 979 tons, ashore at San Chau Island with rock through her bottom plates and other serious damage; salvage operations in progres; *San Cheung*, 389 tons, sunk alongside of Canton Wharf after being washed over that at which she was lying; feared total loss; *Pakkong*, 295 tons, total loss in Yaumati Bay; *Hongkong*, 413 tons, foundered in Yaumati Bay; total wreck; thirty-two lives lost; *Sun On*, 113 tons, stranded in Yaumati Bay; refloated with slight damage; *Shun Lee*, 380 tons, superstructure damaged while lying at the company's wharf; *Coptic*, 2,744 tons, in collision with *Petrarch*, while at her buoy; bow plates on both sides damaged; left port without being repaired; *Loongsang*, 1,093 tons, received slight damages in collision with steamers *Chip Shing* and *Haimun*; *Sierra Marena*, 2,283 tons, received minor damages while lying off Quarry Bay; *Chip Shing*, 1,199 tons, port side damaged in collision with steamers *Loongsang* and *Fooksang*; *Kutsang*, 3,110 tons, damaged in collision with steamer *Charles Hardouin*, repairs effected; *Albatross*, 83 tons, sank near the Nine Pins; 113 lives lost, including those of the captain and chief engineer; H. M. S. *Pheonix*, 1,050 tons, ashore on her side close to the Torpedo Depot; total loss; H. M. S. *Taku*, destroyer, damaged while in Torpedo Depot camber, Kowloon; H. M. S. *Moorhen*, gunboat, slightly damaged while inside Naval Camber; H. M. S. *Robin*, gunboat, slightly damaged and since repaired; *Fooksang*, 1,987 tons, slightly damaged in collision; *Radnorshire*, 1,820 tons, stranded at Yaumati Bay, and bows damaged in collision with steamer *Monteagle;* partly repaired; *Poona*, 4,878 tons, slightly damaged while at Kowloon Wharf; *Canada*, 51 tons, blown a shore and broken up on the rocks at the head of Junk

HONGKONG HARBOR FROM THE PEAK AND SHOWING NEW NAVAL DOCKS





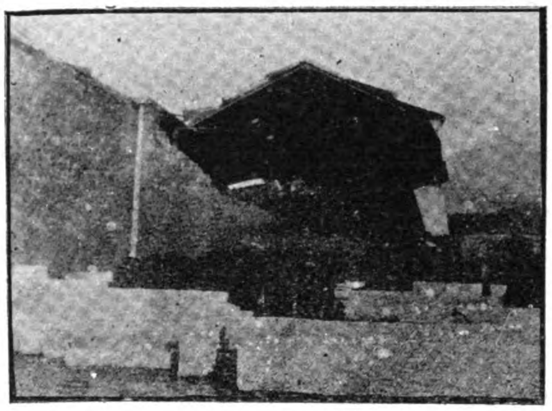
Photos by *Mumeya*, Hongkong.

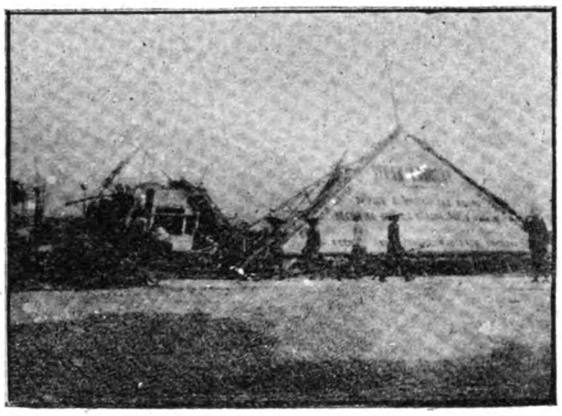
FRENCH DESTROYER "FRONDE" WRECKED IN A CORNER AT KOWLOON; AMERICAN SAILING SHIP "S. P. HITCHCOCK" AND GERMAN STEAMER "PETRARCH" ASHORE AT KOWLOON PRAYA; NOTE DESTROYED WHARVES

Bay; *Choysang*, 1,424 tons damaged in collision and departed without repairs; *Haimun*, 636 tons, minor damage; *Tauian*, 1,042 tons, slightly damaged; *Hoichung*, river steamer, broken up in Yaumati Bay; total loss; Govt. hospital ship *Hygeia*, roof blown away.

GERMAN.—*Prinz Waldemar*, 1737 tons, stranded and damaged in Yaumati Bay; repairs being effected; *Apenrade*, 616 tons, sunk off west end of Stonecutters Island; salvage not started; loss of life believed to be 27; *Johanne*, 952 tons, damaged in collision with steamer *Chow Tai*; became partly submerged and was refloated by salvage ship *Protector*; *Signal*, 907 tons, stranded on rocks in Yaumati Bay and afterwards beached; extensive damage; steamer now under repairs; *Petrarch*, 1252 tons, drifted from her anchorage at Stonecutters and collided with several vessels; stranded at Kowloon wharves with large hole in side and several in bottom; *Emma Lukyen*, 1109 tons, stranded at Mongkoktsui, badly damaged, *Sexta*, 992 tons, stranded in Kowloon Bay;

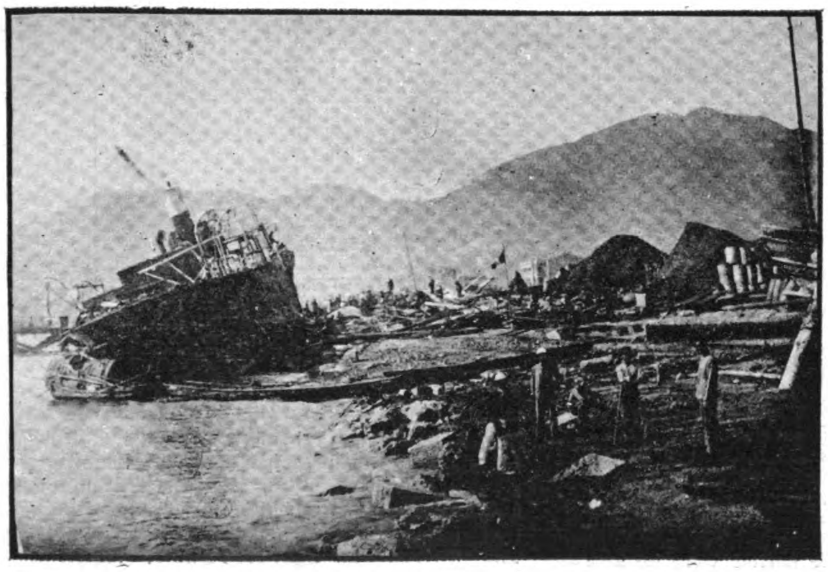
(*Continued on page 165.*)

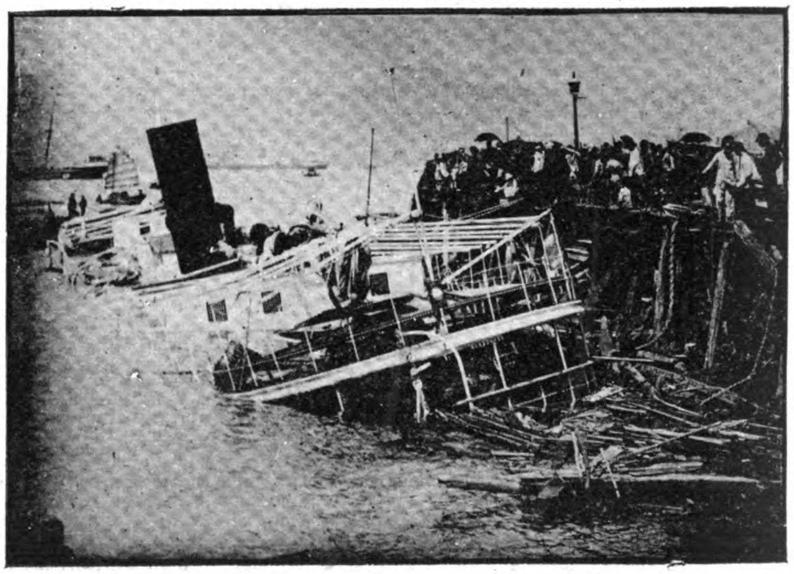




Photos by *Mumeya*, Hongkong.

F. BLACKHEAD & CO.'S GODOWN AT KOWLOON FERRY WHARF





Photos by *Mumeya*. Hongkong.

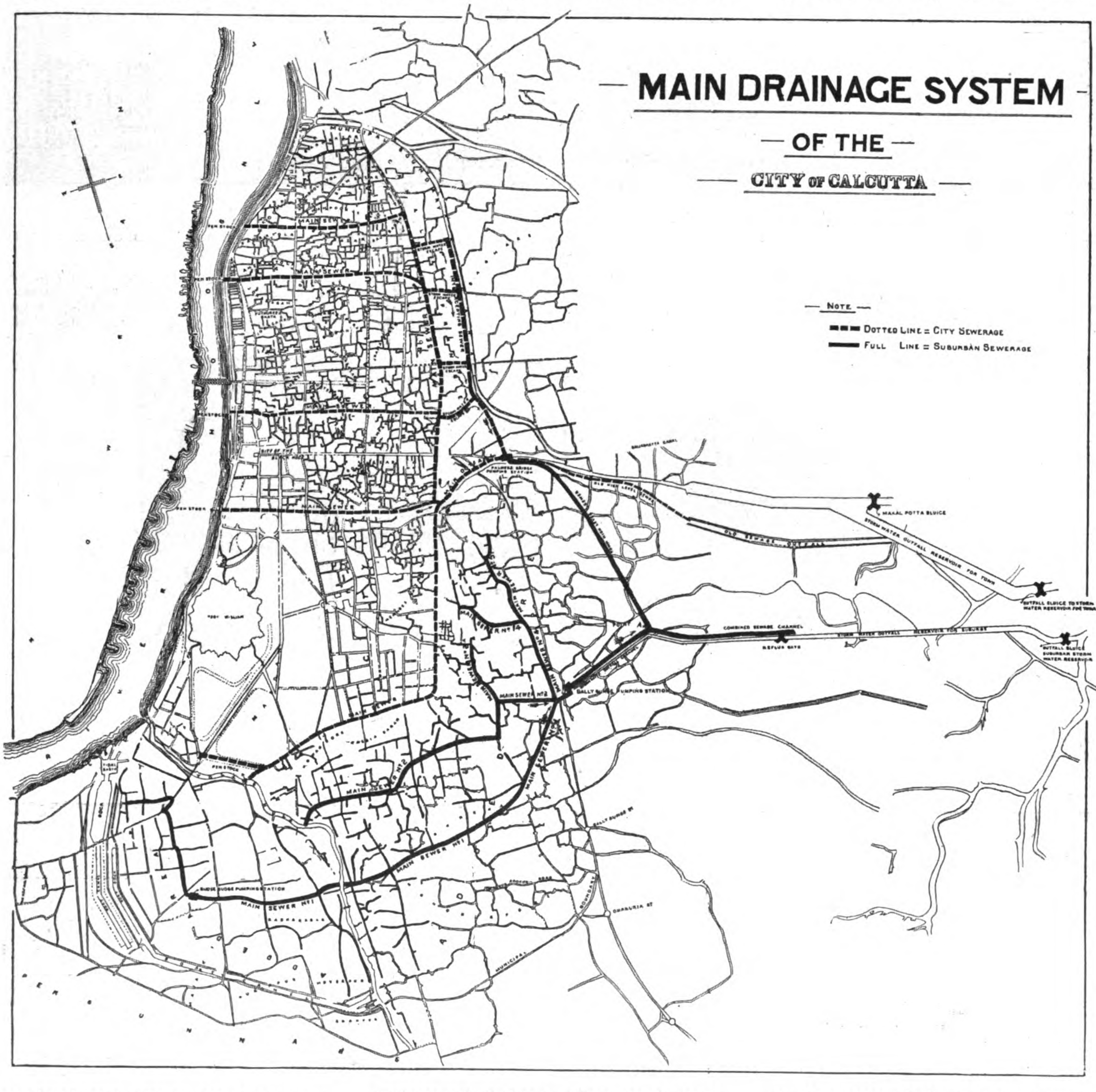
STEAMER "NUESTRA SEÑORA DEL ROSARIO" AGROUND AT YAUMATI; RIVER STEAMER "SAN CHEUNG" SMASHED AT HER WHARF

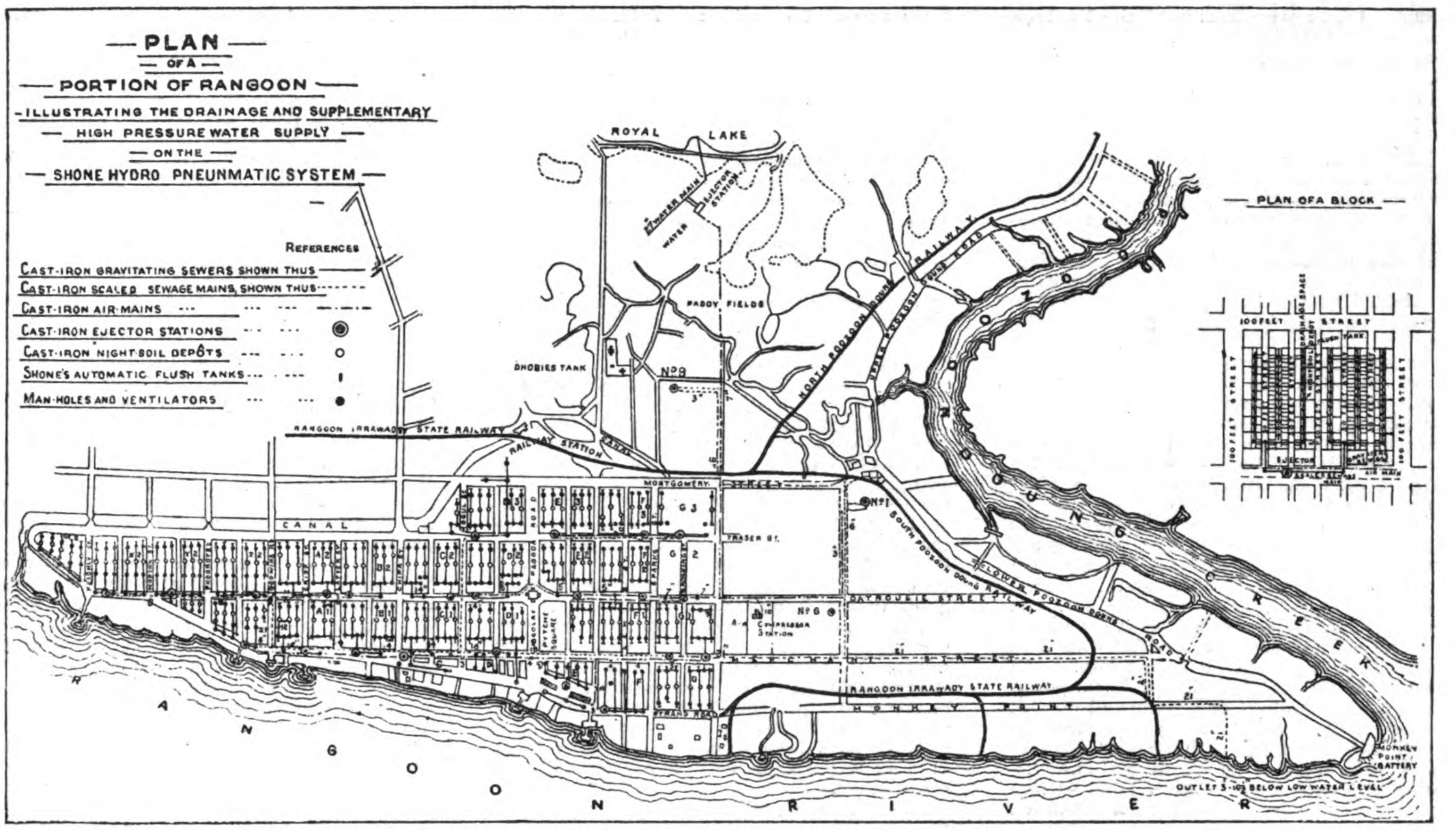
SOME INTERESTING DRAINAGE PROBLEMS OF ORIENTAL CITIES

[*Drainage Problems of the East*, by C. Crakeet James, M. I. C. E., examiner in sanitary engineering to the University of Bombay, is one of the most valuable and instructive work of its kind that has yet come to the office of THE FAR EASTERN REVIEW. It is a revised and enlarged edition of *Oriental Drainage*, written by the same author, and comprises two volumes one of which is devoted exclusively to plans detailing the drainage systems of most of the principal cities of the Orient. The author shows familiar and exhaustive knowledge of the subject he handles, and in his book furnishes to the profession a fund of information about sewerage engineering methods in the field he covers. The Shone and Ault systems seem to be guiding feature of the work. The work is published at the office of the *Times of India*, Bombay, and is also on sale at 121 Fleet-st, London. Part I, Vol. 1, deals with drainage systems, sewers and their construction, public conveniences, house connections, sewage disposal, tank gas, and surface-water and sub-soil drainage. Part II is devoted to the sewerage systems of the municipalities, and it is with the most important of these systems that this review purposes to deal. Price Rs. 20 lor.$6.60 gold.]

SEWERAGE OF CALCUTTA.—Calcutta is situated in the Lower Gangetic Delta, on the E. bank of River Hoogli in latitude 22° 33′ 47″ N. and longitude 88° 23′ 34″ E. In 1905 its revenue was nearly 69 *lakhs* of rupees. The city was founded in 1690, but it was not until 1856 that the municipal authorities awakened to a sense of their duties, and took steps to provide the city with a pure water supply and a proper system of underground drainage. The water had previously been obtained from the river opposite the city and from wells and tanks, the inhabitants storing the water in *chattis* and precipitating the suspended matter by the aid of alum. The foul drainage passed away in filthy open drains.

The authorities of the period were by acts passed in 1856 required to carry out complete systems of pure water supply and drainage, and were empowered to levy rates and borrow money for such works. Schemes for both improvements were prepared and approved with little delay. The water supply was obtained by pumping from the river at Pulta, 20 m. above Calcutta, where the water was free from salt and to possible pollution from the sewerage of the city. The supply commenced in 1870 at 6,000,000 galls. per day, equivalent to 15 galls. per head of the population, which appears to have been about 400,000 at the time. The water was pumped from the river into settling ponds, filtered, and brought by gravitation through a 42″ cast-iron main, 12 m., to a reservoir in the city, from which it was distributed through branch cast-iron pipes along the principal streets. Cast-iron pipes were also laid for the distribution of unfiltered water from the city pumping station (since dismantled) at Chandpal Ghat. The filtered and unfiltered water supplies have been gradually extended to the conditions which obtain at the present day, the former now amounting to 20,500,000 galls.





per day to a population of 960,000 which includes the supply to small areas outside the municipality, the latter 15,500,000 galls. per day to a population of about 740,000 persons.

The geographical formation of the site of Calcutta for a depth of 20 to 30′ is loam, sandy clay, and clay; a peat bed of about 18″ can be struck at varying depths of 20 to 30′ below the surface. A boring has been made to a depth of nearly 500′, but no rock was met with; sand and pebbles were struck at about 200, 300, and 400′, and peat beds at 30 and 300′ below the surface. The absence of marine fossils shows that the strata denote deposits of fresh water, while the peat beds would indicate former land surfaces.

The surface is practically flat inclining from W. to E. with a slope of about 1 in 1,000. The area at present within the jurisdiction of the municipality extends roughly N. and S. about 7 m. The area of the city including the canal fringe is 4,237 acres; and that of the city, Fort William, Maidan, and added area 13,237 acres. The population in 1901 of the city, including the canal fringe, was 588,000, and that of the city and added areas 848,000.

The original sewerage project for the city proper was designed by Mr. Clarke in 1857; it was commenced in 1859. Brick egg-shaped sewers were built under the main streets, stoneware pipe sewers in lanes and valleys. By 1875, 35 m. of brick and 37 m. of pipe sewers were constructed. The sewers gravitated to the pumping station at Palmer's Bridge, where the sewerage was lifted about 10′ to a high level sewer by which it was conveyed about 8,000′ to the "Salt Lakes" (swamps to the E. of Calcutta). The greater part of the storm-water was discharged by storm reliefs into the Circular Canal. The local government subsequently objected to the storm water being any longer discharged into this canal, and in 1882 the municipality was compelled to construct an intercepting sewer for the purpose of collecting the storm-water, and discharging it to an open cut at Palmer's Bridge. This open cut conveyed the storm-water from the main outfall and intercepting sewers to the Makalpotta reflux gates, through which it passed to the Bhidiadhurry River. By 1884 the old project and drainage of the city proper was practically completed.

In 1888 the area of Calcutta was augmented considerably by the addition of the canal fringe, and suburban, generally known as the "added," areas. It then became necessary to prepare drainage projects for dealing with these extensions, and altering the city outfalls to meet future requirements. Projects were formulated by the municipal engineers, and Mr. Baldwin Latham was asked to give his advice. He visited Calcutta and, *inter alia*, pointed out serious defects in the old city system of sewers in cases where the branches join the main "invert to invert," with the result that the free sewerage flow from the branches in such cases is retarded and silt deposits take place, which has to be removed by hand at considerable expense. His recommendation in regard to the alignments and sizes of sewers for the new project was not adopted, although his advice generally was greatly appreciated. The counsel of the municipal engineers prevailed with the Corporation and the works, estimated to cost about 68 *lakhs* of rupees, were placed in the hands of the contractors in 1897. Through certain informalities, the works were suspended under the order of the government in 1900. Fresh plans of the scheme were prepared and submitted to Mr. Latham again for his report in 1901. His report had the effect of causing a large part of the project not already executed to be considerably modified, and the scheme in its modified form is not rapidly approaching completion.

The Calcutta drainage system (old and new) of the present day, as completed or being carried out, is roughly represented in an accompanying plan. Only the main collecting sewers of the city area are shown and are indicated by black lines.

The whole of the city sewers gravitate to the pumping station at Palmer's Bridge. This station has been practically reconstructed under the new project, and two out of three of the old horizontal centrifugal pumps of the original station have been replaced by five compound vertical inverted condensing centrifugal engines of about 100 I. h. p. The pumps with 136 r. p. m. are each capable of lifting 2,100 cu. ft. per min. through a height (lift and force) of 15′ through the town high level sewer. They show an efficiency of 63 per cent. The suctions have no foot valves, the pumps are charged by steam injectors in the pump casings; there are no valves in the pump except a sluice valve on the delivery worked by a hydraulic pump. During the period these pumps have been in use, *i. e.*, about 2 yrs., this installation, which was supplied by Messrs. James Simpson & Co., have proved to be most suitable for pumping sewerage. Three of the pumps are capable of dealing with the maximum sewerage flow of about 5,880 cu. ft. per min. per 1,000 of the population of the area to be drained, 4,237 acres. The balance of power will deal with flush water and future increase. The summits of the main sewers are carried to the banks of the Hooghli where penstocks are fixed for the purpose of periodical flushing, *i. e.*, two or three days in every fortnight, when the height of the tides admits this to be done.

There are silt pits at Palmer's Bridge with wrought-iron bar screens, 1½ spaces, to intercept matters that are inadvisable to pass to the sumps. The sewers are said to be capable of taking ¼″ of rainfall per hr. from the area drained and consequently discharge on the combined system. When the storm-water overcomes the capacity of the pumps or rises to a level above which the outfall sewers are likely to become surcharged, penstocks at Palmer's Bridge are opened, and the storm-water flows to a storm-water head-cut and reservoir, recently excavated through the Salt Lakes, 4½ m. long and 100 to 700′ wide, having a capacity of 52,000,000 cu. ft., and capable of storing ¼″ of rainfall per hr. from the city area throughout the duration of the most inconvenient interval between tides in the Bhidiadhurry River, which was found by tide gauges to be 8½ hrs. At the two outlets of the reservoirs, sluices, fitted with Stoney's roller gates, have been erected to prevent the influx of river water, and admit of the contents of the reservoir being discharged through 4½ hrs. of the ebb-tide; the Makalpotta sluice, which has replaced the old reflux gates, has three gates, 14′ wide and 17′ high, and the Byntolla sluice five gates, 15′ wide and 19′ high. The depth of water to which the above quantity is

estimated to rise over the sills of the Byntolla sluice on the inside is 11′ 6″. The river water on the outside rises to 17′ above the sill.

A new high level sewer, 8′ in diameter, capable of discharging 15,000 cu. ft. per min., has been constructed from Palmer's Bridge to what is known as Point A, where with the discharge of the suburban system, the city sewerage will flow along an open V-shaped concreted channel to the suburban storm-water reservoir, finally discharging into the Bhidiadhurry River through the suburban storm-water reservoir and sluice. Reflux gates are erected at the head of this reservoir to prevent the sewerage backing towards the city.

The suburban sewerage system now being carried out at a cost of some 45 *lakhs*, out of the budgeted 68 *lakhs* of rupees, and the new outfall works, are designed for any emergency. The main sewer (No. 1), draining 2,516 acres, is capable at its outfall of discharging 8,900 cu. ft. equivalent to a maximum average sewer flow of 1,258 cu. ft. per min. or 10 cu. ft. per min. per 10,000 of the estimated future population of 125,800 taken at 50 per acre (the last census return for the area 33, plus 50 per cent increase), with a velocity of 2¼ to 2½′ per sec. and also 7,642 cu. ft. per min., or say 3 cu. ft. per min. of rainfall per acre of the area drained. The sewers for the higher district will gravitate to the Budge-Budge-rd steam-power pumping station, where both sewer and rainfall together will be lifted 13′ by two centrifugal and two direct-acting horizontal plunger pumps of a total of 54 p. h. p. The discharge will pass along a high level surface sewer to the Tolly Nullah tidal channel, under which it is proposed to syphon it through two 30″ diameter steel tubes laid through the bed of the nullah. The sewer then continues eastward to deliver these quantities to the silt pits at Ballygunge pumping station.

Main sewer (No. 2), which near its outfall also takes the discharge of main sewers 4 and 5, was modified after 1901, and provides for the discharge of 10 cu. ft. per min. per 1,000 of the estimated future population, plus twice that quantity of rainfall, or ⅓ sewerage and ⅔ rainfall, from an area of 1,406 acres. The velocity of the maximum future sewerage flow is estimated to range between 2¼ to 2½′ per sec. in the main sewers and between 2½ to 3′ per sec. in the branch sewers. When the sewers flow full the velocity will be increased about 11 per cent. The future population is taken at the last census rate for the district drained, of 60 per acre plus 50 per cent increase, or 90 per acre, and the rainfall is estimated at ¾″ per day over 1,406 acres. The full bore capacity of the sewer is estimated at 1,265 cu. ft. per min. of sewage, plus 2,540 rainfall, or 3,805 cu. ft. per min., which will discharge into the silt pits at Ballygunge pumping station. The branch sewers of both mains range between 24 to 6″ in diameter, and at the summits (generally 9, 8 or 6″ sewers) is a Miller's automatic flushing chamber.

The Ballygunge pumping station will be provided with four Tangye coupled compound surface-condensing centrifugal side-suction pumping engines, each capable of raising through a height of 18′, 1,760 cu. ft. per min. or through a height of 10′ 6″ direct into the suburban storm-water head cut, by which it will flow to the storm-water reservoir and be discharged through the suburban sluice gates to the Bhidiadhurry River.

The high level sewer will deliver the sewerage at Point A, where with the city sewage it will continue in the combined sewage channel to the suburban storm-water reservoir and pass out into the river through the suburban Byntolla sluice, which is a sluice of three bays fitted with Stoney's roller gates of a similar design to those of the Byntolla town sluice.

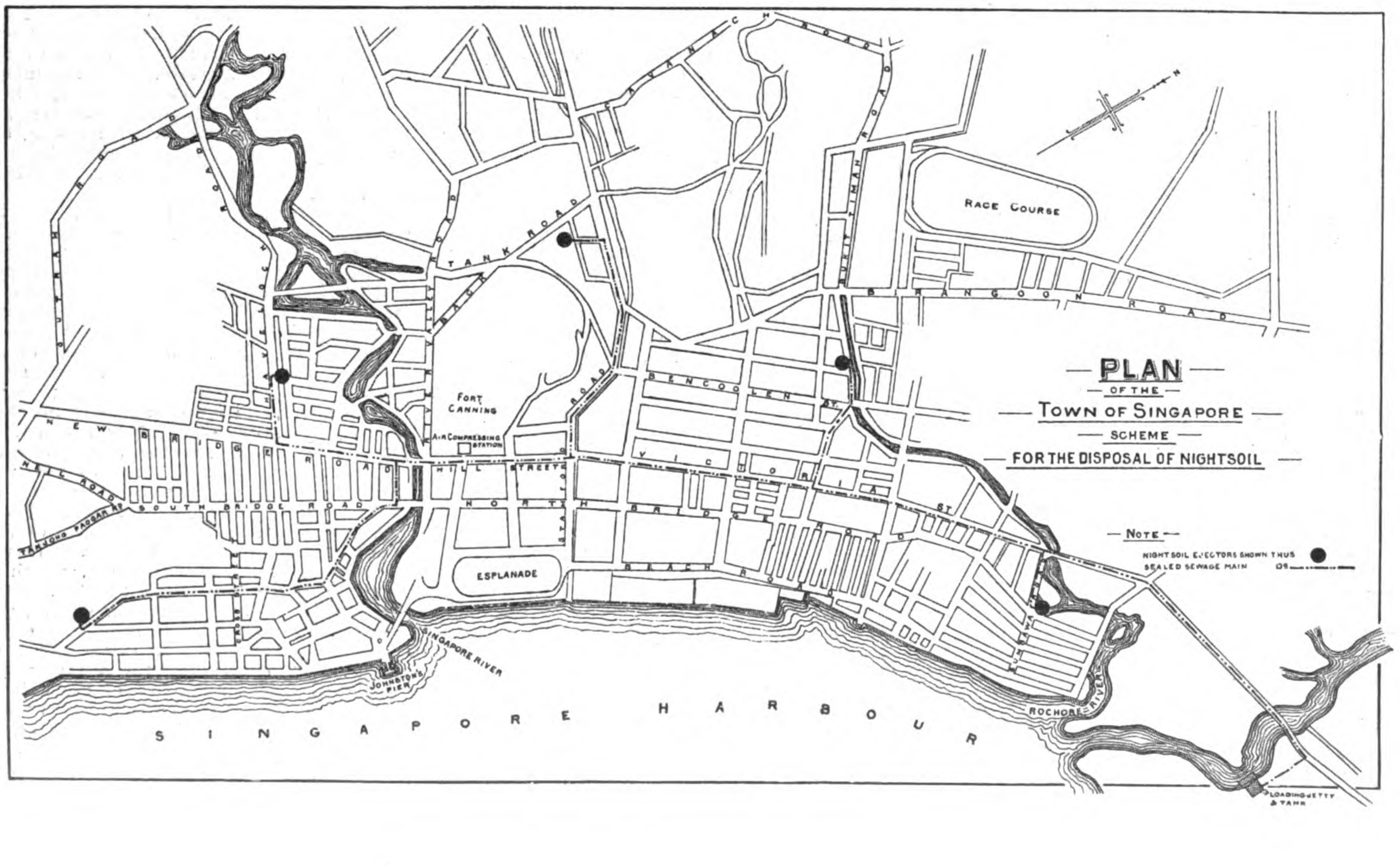
The sewers, as will be seen from the above, take only a small proportion of rainfall. It is proposed to make provision for the disposal of storm-water from the suburbs by means of surface drains to discharge into the suburban head cut. For temporary dealing with the undeveloped and poorer areas, pail depots, public latrines, and bathing platforms connected with the sewers are provided at various points of the city and suburbs. Night-soil is collected from these areas and conveyed in buckets or carts to the pail depots. Other properties have either modern fittings or various types of eastern sanitary fittings and are connected direct with the sewers. Water from the streets in which sewers exist is carried off through gullies of the usual type.

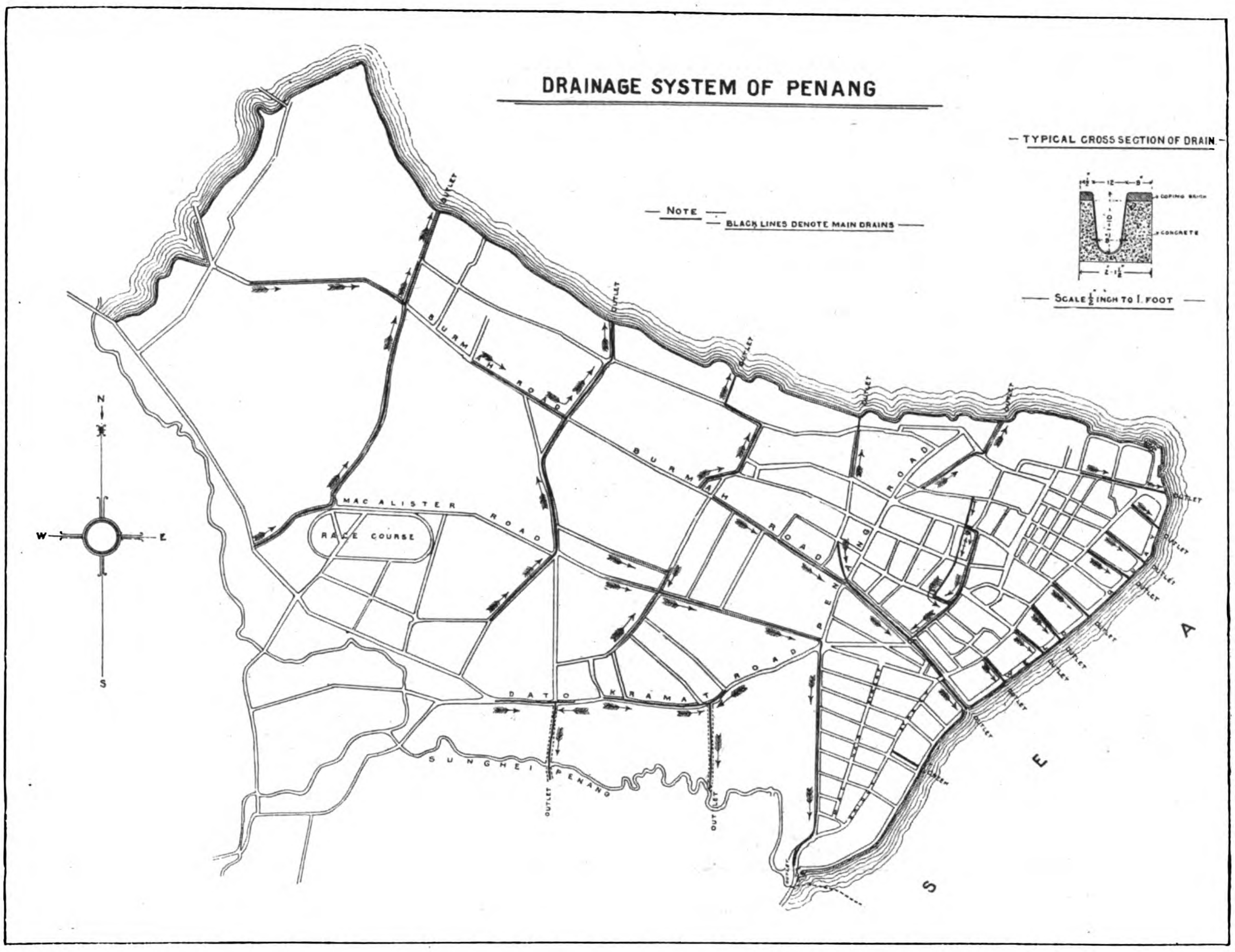
SEWERAGE OF KARACHI.— Karachi is the capital, chief port, and military headquarters of Sind, and is situated some 500 ms. to the N. of Bombay City. The population, according to the census of 1901, was 116,663, Mohamedans largely outnumbering those of any other race. Karachi has a municipality with an annual income of 12 *lakhs* of rupees.

The water supply is derived from wells which tap the subterranean beds of River Lyari, about 18 ms. from Karachi. From this source about 2,000,000 galls. of water a day are derived. The native city is drained on Shone's hydro-pneumatic ejector system, which was designed and completed in September, 1905, by Mr. James Strachan, C. I. E., then engineer of the municipality.

The area at present sewered is about 175 acres and contains, according to the census of 1901, a population of 27,128. The cost of the work amounted to Rs. 5,97,000, which is equivalent to Rs. 21-10-3 per head of population.

The subsoil of Karachi is of a sandy nature, largely impregnated with brackish water, for which reason all the ejectors are placed in chambers of cast-iron tubbing. This tubbing is made of cast-iron flag plates, 1¼″ thick, built up in sections. Access is obtained to the ejectors from the road by means of a circular cast-iron shaft, in which a wrought-iron ladder is fixed. The ejector stations are six in number and the ejectors are fixed in pairs in each station, each being capable of discharging 200 galls. These, as well as the tubbing, were supplied by Messrs. Hughes & Lancaster, of England. The sealed sewage and air mains were provided and laid by the same firm. The former were tested to maintain a pressure of 55 lbs. per sq. in. during a period of 2 hrs. The gravitating sewers, owing to the nature of the subsoil, were laid partly with cast-iron pipes and partly with glazed stoneware pipes; the former being used wherever excessive water was met with in the excavation. The gradients for the pipe sewers vary from 1 in 80 to 1 in 150. The usual manholes and flush-tank arrangements have been provided, all manholes





over 7′ in depth being circular in shape and built of cement concrete rings, with the exception of five joining the ejectors, which are of cement brick-work. The construction is well suited to a saturated sandy soil.

At the head of each line of gravitating sewer, there is a flush tank fitted with an automatic syphon and connected by a service pipe to the nearest water main. The flush tanks are of various capacities, from 200 galls. downwards. The sewers are ventilated on Shone and Ault's system of utilizing the exhaust air of the ejectors, which is discharged up a shaft, also connected with the sewer.

The air-compressing machinery was supplied by Messrs. Hughes & Lancaster and comprise two engines of about 25 i. h. p., each capable of compressing sufficient air to deliver 375 galls. of sewage per min. from the six ejectors. The lift, including friction, does not exceed 130′ and the actual working lift, exclusive of friction, does not exced 51′. The two boilers are of the type known as "dryback" tubular boilers, each being capable of supplying sufficient steam at 120 lbs. per sq. in. pressure to work one of the air-compressing engines. The whole sewage of Karachi is disposed of on a sewage farm.

It is proposed to extend this drainage system.

Rangoon Sewer System.—Rangoon was the first city in the East to establish the Shone hydro-pneumatic ejector system of sewerage. It is the capital of Burma and has a population of 240,000. The water supply is derived from the Hiwaga water scheme, and is equal to 40 galls. per head of population *per diem.*

The portion of Rangoon drained on the Shone system is divided into 22 blocks; and between every two lines of houses there is a space of 15′ left for drainage purposes. In these spaces, 6″ gravitating sewers have been laid at steep inclinations, none being flatter than 1 in 200. Each block is provided with automatic ejectors, into which the sewage flows by gravitation. The ejectors, which are in duplicate, each being 200 galls. capacity, are fixed in iron tubbings at levels below the ground to suit the levels of the blocks from which they receive the sewage: and these ejectors, when full, automatically discharge the sewage into the mains through the medium of compressed air, which is supplied from the air-compressing station to small cast-iron pipes, which are connected with the ejectors by automatic valves. The mains are cast-iron pipes, varying in size from 6″ at the extreme W. of the town to 21″ from the E. of the town to the outfall near the Arracan Company's mill, the sewage being ejected into the river below low-water mark at a spot where the set of the current is against the bank at all stages of the tide. By this arrangement the sewage is immediately dissipated and does not accumulate. At the end of each drainage space is an automatic flushing tank. The flush tanks are of 200 galls. capacity and stand at the head of each gravitating sewer and can be regulated to discharge as often as necessary. Night-soil depots are now done away with.

The air for working the sewage and water ejectors is compressed at a station in the E. portion of the city and is laid on to the ejectors through pipes varying in size from 2 ½″ to 10″ The air is compressed by means of triple-expansion, non-condensing engines, working at steam pressure of 150 lbs. per sq. in. above atmosphere. There are now five sets of engines but no more than three are worked together. Each set of engines has three air-compressing cylinders and the compressed air is stored in two air receivers, each being 8′ in diameter and 24′ long.

Extensive plans have been proposed for the improvement and extension of this system to meet the demands of the city's natural growth.

Sewerage of Singapore.—This city is the principal commercial center of the Straits Settlements, and consists of an island 27 ms. long by about 14 ms. broad, lying at the S. end of the Malay Peninsula. At present it has a population of about 150,000.

Singapore has no regular system of sewers. The whole of the sullage from baths and kitchens is conveyed by open roadside drains, constructed along the sides of the streets, which ultimately discharge into the tidal river and the sea at various convenient points. These drains are cleansed and swept twice a day by municipal laborers.

Early in 1904, the municipal engineer reported to the authorities that the discharge of night-soil into the sea was the most satisfactory way of dealing with the drainage problem, and that the main channel on the S. side of St. John's Island would be the most suitable position for that discharge, the currents at this place being E. and W. Taking 1½ lbs. of night-soil and urine per head per day, he estimated that 100 tons *per diem* would have to be removed. His scheme for the removal of night-soil was to divide the city into districts and to have in

DRAINAGE SYSTEM OF KARACHI

each district a Shone ejector, which would receive the excreta and then discharge it into a sealed sewer main, varying in size from 3" to 8" at the final landing jetty, whence it would be discharged into barges and from them be shot into the sea. The estimated quantity of excreta to be dealt with at each receiving ejector would be 4,050 galls. or 18 tons. The total cost of the proposed scheme, exclusive of the cost of pails, was estimated at $580,710 Straits currency, and the annual working expenses at $239,008.

SEWERAGE OF GEORGE TOWN, PENANG.—George Town (Penang) is situated on a cape on the Island of Penang just off the W. coast of the Malay Peninsula. The site is triangular in shape, two sides being bounded by the sea and one side by the mountains which rise to a height of about 2,700'. The population of the town is about 100,000 persons, more than half of which are of various Chinese races. There is also a large proportion of Indian people and a smaller number of the original Malays. In addition to these there are representatives of practically every race in Asia and Polynesia as well as Europeans. It will thus be seen that the ideas and prejudices of a very dissimilar people must be regarded in this town. The average amount of rainfall is about 112" and is of the usual tropical nature, the effect of which is accentuated by the close proximity of the mountains. Rainfalls at the rate of 1" per hr. are fairly frequent and an even faster rate is not unusual.

The town is built on a flat alluvial plain with a very slight fall from the foot of the hills to the sea, a great part of the town being not more than 2 or 3' above high-water level spring tide. The rise and fall of spring tides is about 10', but during neap tides the water level remains practically stationary for several days at about half-tide level. In former years a large amount of flooding took place and the lower stories of European, Chinese and Indian dwellings were often flooded for days together.

As a first step to check flooding, intercepting channels were constructed across the general line of drainage, and so arranged as to intercept the flood water flowing from the suburbs towards the town and lead it by shorter routes to the sea. In forming these channels advantage was taken of a number of cross-roads constructed in embankment to form one side of the channel and divert the flood water. These channels are constructed partly in concrete and brickwork and partly in earth.

The cost of a pumping system to deal with sudden and heavy floods would be very heavy. No attempt has therefore been made to construct a self-cleansing system of sewers and the drains are of the open pattern. All closets are built outside the houses and are provided with pails. Household refuse is removed by scavenger carts.

SEWERAGE OF SHANGHAI.—The international Settlement of Shanghai has an area of 8¾ sq.ms. and a population of over 11,000 whites and 450,000 Chinese, excluding the shipping population. The normal rise and fall of the tide is about 11'. The country both in the Settlement and for miles around is very flat. The rainfall averages 43.60" *per annum*. June is preeminently the rainy month, both for frequency and abundance. The devotion of the Chinese agricultural pursuits forms the solution of the economical disposal of the ordure of the Settlement, and the Municipal Council derives a net income of about Tls. 47,770 therefrom under contract for the right of collecting night-soil in the Settlement. The system works well and the whole of the night-soil is removed daily before 9 o'clock in the morning. Owing to the numerous outlets provided by the natural creeks there are no large main outfall sewers, the largest being 3'×2.' Tidal flap valves are not used and the tide is left free to circulate through the sewers, whose inclination, owing to the flatness of the district, rarely exceeds 1 in 500. Wherever possible, dead ends are avoided in order that the tidal water may circulate through the various systems. The majority of the roads, of which there are 87 ms., are macadamized, and consequently a large amount of detritus finds its way to the street gullies, which are also emptied periodically. Rigid supervision is maintained over all private drainage works.

Owing to the difficulty of obtaining stoneware pipes at a reasonable cost, the council manufactures its own pipes of concrete. They are made of the usual pattern in 2' lengths with spigot and socked joints. Other pipes of standard sizes are also manufactured.

The water supply of the Settlement is in the hands of the Shanghai Waterworks Company, Ltd., and the supply is drawn from the Whangpoo River, about 2 ms. below town. The water is drawn off at high tide and goes through a process of settling tanks and

filters of sand. The quality of the water is excellent.

Benares, Lucknow and Mirzapur, India.—Benares has a population of about 208,000 and is expending Rs. 34,00,000 for the construction of its sewer system. Lucknow has a population of nearly 300,000, and is spending Rs. 20,00,000 for its sewerage. The sewerage works of Mirzapur are nearing completion and are estimated to cost Rs.2.25,000. The town has a population of 56,000.

BIDS ON LOCOMOTIVES, BANGKOK

Bids to supply the railways of Siam with nine passenger and seven freight locomotives, with spare parts for same, were opened recently by Director-General Weiler, of the Royal Siamese Railway Department, at Bangkok. The tenders, in each case being the price per unit, were as follows:—

Orenstein and Koppel, Berlin.—Passenger £2,020, total with spare parts £24,989 17s.; freight £2,435, total with spare parts £23,375 16s. Grand total £48,364 13s.

John Cockerill, Ltd., Seraing, Belgium.—Passenger £1,976, total with spare parts £24,292 16s.; freight £2.149, total with spare parts £22,361 8s. Grand total £46,654 4s.

Krauss & Co., Munich.—Freight £2,900, boiler tubes only £8,500. Grand total £28,800.

Baldwin Locomotive Works, Philadelphia (per Sanders & Co., London)—Passenger £1,860, total with spare parts £24,489 18s; freight £2,370, total with spare parts £23,121 14s. Grand total £47,611 12s.

J. A. Maffei, Munich.—Passenger £2,215, total with spare parts £27,235; freight £2 555, total with spare parts £24,715. Grand total £57,950.

Richard Hartmann Works, Chemnitz (per A. Markwald & Co., Ltd.).—Passenger £2,120, total with spare parts £26,480; freight £2,160, total with spare parts £25,670. Grand total £52,150.

Compagnie de Fives-Lille, Paris.—Passenger £2,780, total with spare parts £34,102 16s; freight £3,320, total with spare parts £31 252 4s. Grand total £65,355.

Schweizerische Lokomotiv und Maschinen Fabrik, Winterthur.—Passenger £2,420, freight £3,000. (Spare parts were quoted for in detail but the totals were not given.)

Andrew Barclay, Sons & Co., Ltd., Caledonia Works, Kilmarnock.—Passenger £3,062, total with spare parts £37,92· 15s; freight £3,858, total with spare parts £36,257 18s. Grand total £74,181 13s.

Berliner Maschinen A. G., vormalls L. Schwartzkopff, Berlin.—Passenger £2,100, total with spare parts £26,145; freight £3,858, total with spare parts £25,000. Grand total £51,145.

Bolling & Lowe, London.—Passenger £2,300, total with spare parts £28,612 16s; freight £3,050, total with spare parts £28,897 8s. Grand total £57,510 4s.

Maschinenbau Anstalt "Humboldt" Köln.—Passenger £2,300, total with spare parts £27,913 6s; freight £2,740, total with spare parts £25,982 19s. Grand total £53,896 5s.

Vegn och Masken Fabriks Aktiebolaget, Stockholm.—Passenger £2,650, total £23,850; freight £3,500; total £24,500. Grand total £18,350. (Spare parts not bid for.)

Boyne Engine Works, Leeds.—Passenger £2,575, total with spare parts £35,081 11s; freight £3,330, total with spare parts £32,960 3s Grand total £68,011 14s. (Prices without freight, f. o. b. Birkenhead.)

Hannoversche Maschinenbau A. G. vormalls Georg Egestorff Hannover Linden.—Passenger £1,980, total with spare parts £24,840; freight £2,620, total with spare parts £25,130. Grand total £49,970.

Beyer, Peacock & Co., Manchester.—Passenger £2.675, total with spare parts £35,523; freight £3,250, total with spare parts £33,281 10s. Grand total £68,804 10s.

Zeitz & Co., London, for Stettiner Maschinenbau A. G., Vulcan, Stettin.—Passenger £2.600, total with spare parts £31,940; freight £3,200, total with spare parts £30,820. Grand total £62,760.

American Locomotive Company, New York.—Passenger £2,053 7s. 9d., total with spare parts £24,591 4s. 9d.; freight £2,176 11s. 10d., total with spare parts £20,221 9s. 8d. Grand total £44,812 14s. 5d.

Oesterreich Staats Eisenbahn Ges., Vienna.—Freight £2 860, total with spare parts £27,220.

A. Borsing Tegel, Berlin.—Passenger £2,055, total with spare parts £25,879; freight £2,650, total with spare parts £25,361. Grand total £51,240.

Nederlandsche Fabriek van Werktuigen en Spoorwegmaterieel, Amsterdam.—Freight £2,046, total with spare parts £28,013 10s. 8d.

Henschel & Sohn, Cassel.—Passenger £2,040, total with spare parts £25,590 10s. 6d.; freight £2,490. total with spare parts £23,989 9s. 4d. Grand total £49,579 19s. 10d.

Nasmyth, Wilson, & Co., Bridgewater Foundry, near Manchester.—Passenger £2,757, total with spare parts £33,372; freight £3,095, total with spare parts £30,668 10s. Grand total £64,035 10s.

La Metallurgique S. A., Brussels.—Passenger £2,800, total with spare parts £28,612 16s.; freight £3,050, total with spare parts £28,897 8s. Grand total £57 510 4s.

Hohenzollern A. G. für Lokomotivbau, Düsseldorf.—Passenger £2 250, total with spare parts £26,896 10s, freight £2,560, total with spare parts £23,885. Grand total £50,731 10s.

Robert Stephenson & Co., Ltd., Darlington.—Passenger £2,455, total with spare parts £33,030; freight £2,735, total with spare parts £28,421 15s. Grand total £61,451 15s.

Nydqvist & Holm, Trolhättan, Sweden.—Passenger £2,411 2s. 2d., total with spare parts £25,829 1s. 11d.; freight £2,859 8s. 11d., total with spare parts £23,718 14s. Grand total £49,547 15s. 11d. (Freight for locomotives included, but not for spare parts.)

Aktien Gesellschaft der Lokomotivfabrik vorm. G. Sigl, in Wiener-Neustadt.—Passenger £2,270, total with spare parts £27,937 12s. 2d.; freight £2,800, total with spare parts $26,586 18s. 7d. Grand total £54,524 18s. 7d.

Dutilh, Smith, McMillan & Co., London.—Passenger £2,380, total with spare parts £28,471 10s.; freight £2,881, total with spare parts £26,861 16s. Grand total £55,333, 6s. (Submitted by Bombay-Burmah Trading Corporation, Ltd.)

S. A. Franco-Belge, à la Croyère, Belgium.—Passenger £2,510, total with spare parts £32,222 0s. 6d.; freight £2,956 10s., total with spare parts £28,956 7s. 6d. Grand total £61,178 8s. (Submitted by Clarke & Co., Bangkok).

S. A. Saint Léonard, Liège.—Passenger £2,280, total with spare parts £27,820; freight £2,620, total with spare parts £26,540. Grand total £54,360. (Submitted by G. Kluzer & Co., Bangkok).

Wiener Lokomotivfabrik A. G., Vienna.—Passenger £2.400, total with spare parts £29.660.

S. A. des Forges, Usines et Fonderies de Haine St. Pierre.—Passenger £2,310, total with spare parts £27,628 4s.; freight £2,800, total with spare parts £26,045 12s. Grand total £53,673 16s. (In a covering letter this company said that the two totals could be reduced to £26,523 1s. 5d. and £25,003 15s. 6d respectively, making a grand total of £51,526 16s. 11d.)

Howarth Erskine, Ltd., Bangkok.—Passenger £2,451 8s., total with spare parts £29,326 9s. 5d.; freight £2,570 10s. 4d., total with spare parts £27,667 15s. 2d. Grand total £56,994 4s. 8d.

PUBLIC WORKS PROGRAM FOR 1907, HONGKONG

At a recent meeting of the Legislative Council of Hongkong, Sir Matthew Nathan, Colonial Governor, dealt at length on the colonial estimates for 1907. With reference to public works for the coming year he said.—

In the Public Works Department the decrease of $30,620 is due to higher exchange on salaries and the increase of $7,750 is due to automatic changes and the operation of the gradient scheme. Building overseers' salaries have been raised to bring them in line with sanitary inspectors. The further increase of $88 is for minor alterations in conveyance and allowance. The net decrease in the public works is $21,986. In public works recurrent the increase of $4,000 is for the maintenance of buildings and $9,000 is for the maintenance of roads, $4,000 is for the maintenance of water works. The new item put in of $12,500 is for typhoon damages. That amount is based on the average spent on repairs on damage caused in past years. Hitherto it has been customary to make a special vote, but it is more satisfactory to include the item in the estimates. The decrease of $10,000 under public works recurrent is for the maintenance of lighting. This is due to a reduction in the price of gas which we succeeded in obtaining from the gas company. The net increase on public works recurrent is $28,300. In public works extraordinary, whereas for buildings in 1906 we inserted $480,100 we have inserted only $381,500 in the estimates for 1907, or nearly $100,000 less. First of all we have completed a certain number of buildings in the current year. These are the harbor office, the western market, the Mongkok Tsui Market, the Shanghai Postoffice and five small buildings. I do not propose to go on with the prison at the present time. It appeared to be a very urgent necessity 2 yrs. ago when we hardly knew what to do with prisoners, but fortunately the number is so much reduced that we are not only not overcrowded but enabled to close the branch prison. In these circumstances the necessity for an additional prison can be reasonably cut out from the estimates. We have in the estimates some amounts for proceeding with the Supreme Court and Postoffice. The amount we considered we could effectually spend in pushing on the work as much as possible. Then we have had to include amounts for certain buildings already in progress or for which contracts are let. The estimate for the latrines, urinals, time-ball station at Kowloon, Postoffice at Wanchai and the Kowloon Mortuary next year is $21,500. Then there are two new buildings and it is proposed to put only these two in hand. One is the land office at Tai Po. This is absolutely necessary in order to prevent the risk of destruction of all land records pertaining to the new territories, and the estimated cost is $15,000. Then it is proposed to erect a market at Quarry Bay, the estimated cost of which is also $15,000. This was recommended by the Sanitary Board. The continuation of the Supreme Court and the postoffice, with these two buildings, bring the vote up to $381,500. For communications last year we estimated $216,800. This year we included in the estimate for communications two items in connection with the railway amounting to $100,000 which will eventually be repaid to the revenue from the railway. The Government also estimated for the completion of Conduit-rd but it is not possible to quite complete that with the amount inserted in the present year's estimates, which is comparatively small to what was inserted last year. We have still got the item for extending Robinson-rd, Kowloon, and an item for roads in the new territories, and we have slightly increased the item for forming aand curbing streets as additional buildings required that the streets should be ready for them. Drainage for which last year you voted $70,000 is estimated this year at $80,000, $10,000 having been added for miscellaneous drainage works the amount at present in the estimates not having proved sufficient. For the extending of lighting there is a small amount of $2,500 inserted. Miscellaneous is $90,100, $70,600 of which stood in the estimates for 1906. Of this, $20,000 is for a permanent shelter for Blake Pier. In the original grant it was also proposed to renew the Queen's Statue Pier, but we will have to let that remain for another year. In the meantime Blake Pier will be improved in accordance with my promise to the council sometime ago. The other items are small ones which I intend to discuss in detail. There is $5,000 for the renewal of the survey of the marks in the New Territory. This is necessary as otherwise the survey would be lost and we would have difficulties in connection with laying out the line. $22,000 is for concreting piers and the existing work has already commenced. $9,000 is for reclaiming the Taipo fish pond as intended to prevent what we believe will be an important place in the future from getting into an unsatisfactory state at the commencement. Under the *Public Health and Buildings Ordinance* I have estimated only $20,000 as against $160,000 this year. $20,000 is entirely for compensation we have to pay under the provisions of the ordinance. No amount has been included this year for the resumption of insanitary property for which $150,000 was included last year. In waterworks provision has been made for $536,600 and $286,300 of this amount is required for the completion of the Kowloon gravitation scheme, and the Tytam Tuk first section. The remaining $200,000 is for starting the Tytam Tuk second section in accordance with my promise to the council.

Program of Extraordinary Works.

The program of public works extraordinary is detailed in the estimates as below. Against each item is the amount provided to be expended in 1907.

1	Law courts......$	160,000
2	Postoffice	160,000
3	Public latrines and urinals	12,000
4	Mortuary at Kowloon	7,500
5	Time-ball tower on Blackhead's Hill, Kowloon	6,000
6	Branch postoffice at Wanchai	6,000
7	Landoffice at Tai Po	15,000
8	Market near Quarry Bay	15,000
	Communications.	
9	New roads in Victoria, Extension E. and W. of Conduit-rd	14,000
10	New roads in Kowloon	30,000
11	New road in new territories	15,000
12	Forming and Kerbing-st	40,000
	Drainage.	
13	Gullies reconstruction	10,000
14	Training nullahs	20,000
15	Large flushing tanks for main sewers and substitution of iron for earthenware pipes	5,000
16	Miscellaneous drainage works	45,000
	Lighting.	
17	Extension of gas lighting	2,500
	Miscellaneous.	
18	Permanent marks for traverse survey points in new territories	5,000
19	Reinforced concrete piers at Green Island gunpowder depot, new harbor office and Kowloon City	22,000
20	Blake Pier shelter	20,000
21	Resuming and filling in fish pond at Tai Po	9,000
22	Miscellaneous works	35,000
23	Store account	100
	Public Health and Buildings Ordinance, 1903.	
24	Compensation	20,000
	Waterworks.	
25	Albany filter beds, reconstruction and extension	30,000
26	Kowloon water works, gravitation scheme	256,600
27	Tytam Tuk scheme, first section	30,000
28	Tytam Tuk scheme, second section	200,000
29	Miscellaneous waterwoks	20,000
	Total public woks, extraordinary......$	1,210,700

PHILIPPINE CONTRACTS

The director of the Bureau of Supplies, Manila, has awarded the following contracts for the Philippine Government:—

To Frank L. Strong, Manila, 30,000 lbs. blue vitriol @ ₱0.174 per lb., and 10,000 glass insulators @ ₱0.082 each; to Grant & Company, Ltd., Manila, 5,000 coppers for battery @ ₱0.0868 each, 1,000 lbs. salmonia @ ₱0.18 per lb., 500 signal service brackets @ ₱1.5728 each, 100 mis. telephone wire No. 14 @ ₱7.86 per mi., 48 ring coils @ ₱0.98 each, 12 telephone coils @ ₱1.54 each, 1,000 "Gonda" prisms @ ₱0.5624 each; to H. W. Peabody & Co., 10,000 wooden insulator brackets @ ₱0.0595 each, 2,000 telephone iron poles @ ₱5.60 each, 100 lightning arresters @ ₱1.28 each, 5,000 zincs (crowfoot) @ ₱0.40 each, 2,000 zinc pencils @ ₱0.0525 each, caps "Gonda" cells @ ₱0.13 each, 25 induction coils @ ₱0.73 each, 100 binding posts @ ₱0.1275 each.

Sealed proposals will be received by the Chief Quartermaster, Department of Luzon, at Fort McKinley, Rizal, P. I., on November 1st, for furnishing and delivering and putting in place two steel tanks and trestles and altering one steel tank.

SOME PHILIPPINE FIBERS AND FIBROUS SUBSTANCES: THEIR SUITABILITY FOR PAPER MAKING

Condensation of an Article in "The Philippine Journal of Science," by Mr. George Richmond, Government Chemist, Bureau of Science, Manila.

[EXPLANATORY NOTE.—Samples of handmade paper manufactured at the Bureau of Science from abacá waste and cogon grass accompany this article. They were furnished to the REVIEW by Dr. Paul C. Freer, M. D., Ph. D., director of the bureau. Similar specimen sheets made from banana, bamboo, palms and other material will be furnished by the director on request. In the manufacture of this paper it was thought best not to alter the pulp in any way, but only to provide pure bleached specimens, thus affording paper manufacturers and others who are interested an opportunity for testing the fiber to their own satisfaction. Consequently, no attempt at loading, sizing, coloring, or calendering the specimens was made. The work required to turn out several reams of handmade paper with apparatus available at the laboratory is very great, and it was practically all performed by Filipinos. Director Freer thinks this speaks favorably for their skill in acquiring facility in manipulations of this kind.—EDITOR.]

In looking over the field in the Philippine Islands for suitable material for the purposes of studying the utility of fibers and fibrous substances for paper making, Mr. Richmond's attention was first directed to abacá, or Manila hemp.

Abacá waste.—It has been observed for a long time that much fiber is lost in the ordinary hand processes for isolating the cordage fiber from this plant, and, in 1887, some of this waste from abacá was sent to Messrs. Gonzales Sons, of Barcelona, Spain, who reported as follows:—

Observations made in the course of fabrication permit us to affirm roundly that abacá waste as raw material for the manufacture of paper is not only utilizable but surpasses esparto and hemp. and, in its treatmen for conversion into paper, excels rags and other material known in the industry.

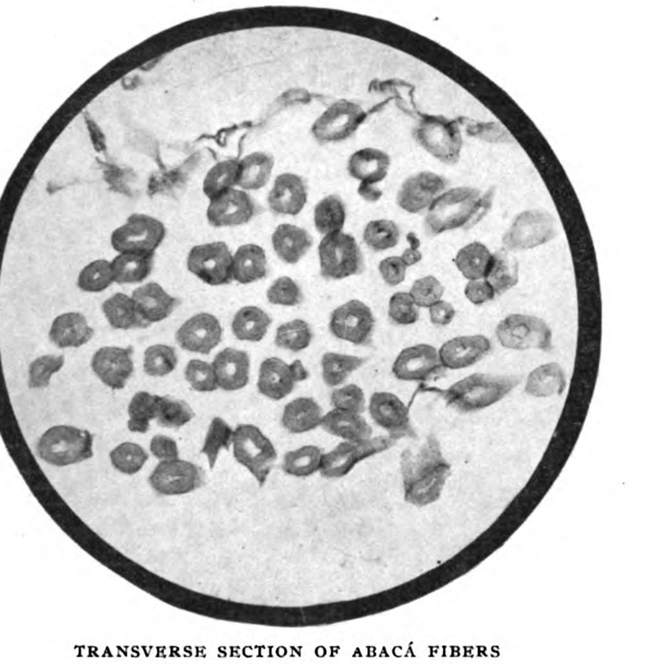
In 1904, a quantity of abacá waste was sent to the Everett Pulp and Paper Company, of Everett, Washington, U. S. A., for further opinion as to its adaptability for paper manufacture. The chemist's report follows:—

The waste as received was very dirty, and could not be used in the way we now treat our wood, but would have to be passed through a duster or "Devil," such as is used for very dirty rags, oakum, rope, etc.

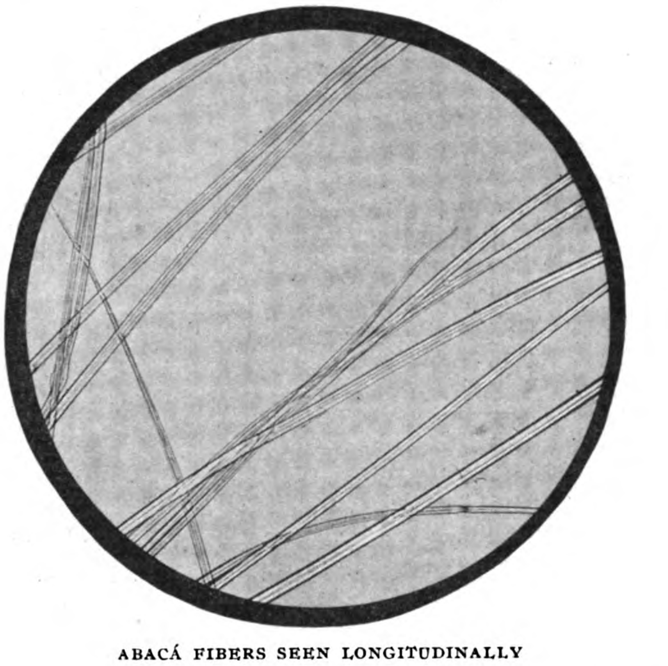
of experiments in stripping abacá by the customary hand process for the purpose of determining the relative amounts of dry cordage fiber saved and dry fibrous waste lost:—

Weight.	S. Ramon. Mindanao	Paete, Laguna.
Weight of green stalk..........kilos...	9.525	15.876
Weight of green fiber............do.....	.4536	.680
Weight of dry fiber. ....do.....	.163	.2268
Weight of green fibrous waste..do.....	1.814	2.494
Weight of dry fibrous waste....do.....	.1769	.199
Percentage of dry waste in stalk.......	1.85	1.25
Percentage of dry fiber in stalk........	.	1.43

The importance of the above data because they seriously influence our judgment of the supply of this waste material, justifies their repetition, particularly as we also subsequently desired to learn the effect of machine stripping on stalks under the same conditions. The following table gives a comparison between the hand and machine stripping processes; the stalks used were from Paete, Laguna, and had been harvested about two weeks before the tests were made. The results are averaged from 10 stalks:—



TRANSVERSE SECTION OF ABACÁ FIBERS



ABACÁ FIBERS SEEN LONGITUDINALLY

This plant is a species of wild banana of which there are several indigenous to, or introduced into, the Philippine Islands, and, as is well-known, so-called Manila paper has long been made from wornout ropes of this fiber. Its superior quality for the manufacture of special kinds of paper where strength is the desideratum is well demonstrated.

According to the 12th report of the United States Census, American paper manufacturers purchased approximately 100,000 tons of so-called Manila stock for use in their mills; the approximate cost was $2,500,000 gold, or $25 per ton. This stock was made up of old, wornout rope, gunny sacks, waste thread, and binder twine, and it includes jute butts and waste. Rags, which the world over are considered to be the finest material for paper making, do not command a much greater price. In the same census year (1900) 234,000 tons of rags valued at $6,600,000 gold, equal to about $28 per ton, were used. Statistics also show an annual output of 90,000 tons of Manila wrapping paper valued at $66 gold per ton and 204,000 tons of "bogus" Manila paper made from wood, rated at $9,150,000 gold, or $45 per ton. A large proportion of the so-called Manila wrappers, paper and envelopes contain mechanical of ground wood, which causes such articles to deteriorate and to turn brown with age. Mr. Richmond says:—

It may be possible in collecting this material to avoid a large part of this dirt.

The waste was submitted to the same process as the wood now being used, except the caustic-soda solution was one half the strength, the time of digesting four and one-half hours, the pressure 100 pounds, and 325° Fahrenheit temperature.

The cooking was done by indirect steam—that is, the heat was produced by a steam coil in the digester, and not direct steam as we use it.

The fiber reduces very easily, and, after being washed in hot water, bleaches to color of sample, with the same amount of bleaching powder as required by the wood pulp.

The loss in the process from the dry, crude material to the dry, bleached pulp is 64 per cent, or, the crude material will produce 36 per cent by weight of fiber ready for the beater.

Under the microscope the fibers are long, slender, and smooth, tapering to a point at the ends; some have small hairs on the sides.

The bleached fiber contained 6 8 per cent ash, while wood fiber has less than 2 per cent and in most instances when well cooked has only 0.3 per cent

This, however, does not detract from the value as a paper-making material.

Owing to the small amount of material received, it has been impossible for me to try any experiments along the line of obtaining the same results by the use of cheaper chemicals. It might be possible to do the work with a solution of lime, the same as straw is treated.

In my opinion this abacá waste can be reduced to a fine, silky fiber, suitable for the best of paper, making a sheet equal to the best linen, or without being bleached, made into a light-gray wrapping paper, which would excel in strength any paper on the market.

In the meantime, the Bureau of Agriculture of the Philippine Islands conducted a series

Weight.	Hand stripped.	Machine stripped.
Green stalk ,.................kilos..	15.876	13.984
Green fiber...................do....	.317	.199
Dry fiber.....................do....	.159	1147
Green fibrous waste..........do....	.273	....
Dry fibrous waste............do....	.199	.635
Percentage of dry waste per stalk.	1.25	4.54
Percentage of dry fiber per stalk.	1.00	.821

Explanation of results.—In order to explain the data recorded in the above table it is necessary to describe the manner in which the stalks were prepared for the two methods of treatment. For the hand stripping, about one foot of each end of the stalks was chopped off to facilitate the removal of the petioles, and three or four of the outer ones, which were bruised and discolored, were also discarded. Then, two or more ribbon-like strips were peeled from the entire length of the outer surface of each layer of the remaining portion of the stalk. Only these thin, fibrous ribbons were subjected to the stripping process. All the cellular portions of

each petiole, together with the outer sheathes and the cut ends, were discarded. These constitute a class of waste distinct from that which results from the stripping operation itself. For reasons which will appear later, this waste is designated as *semifibrous* in distinction from the genuine *fibrous* material collected under the stripping knife.

In the case of the machine-stripped fiber, the stalks were prepared by first removing the ends and outer petioles, as in the method mentioned above, but the remainder was cut lengthwise into sections of the requisite width and then fed directly into the machine, without any attempt being made at the separation of the fibrous from the cellular portions. Hence, the 635 grams of dry waste which remained represented the quantity produced by the actual stripping process and must directly be compared with the 199 grams of dry, fibrous waste obtained by the other method. The machine removed so much water from the waste that its weight in a green state would have afforded no value for comparison; therefore it was not determined.

The machine employed for this test was still in an experimental stage, hence the results obtained do not afford reliable data as to the possible effect of machine stripping on the future supply of abacá fiber and waste, but it was the only opportunity which has thus far presented itself for obtaining even approximate information in regard to this question. This machine waste contains a large amount of fiber of value to the paper maker and the quantity of waste demonstrates the fact that, whereas the outer surface of the leaf petioles undoubtedly contains the strongest fibers which are so valuable to the cordage maker, the cellular portion of the petioles also contains much fiber which is entirely lost by the hand-stripping process.

Semi-fibrous waste.—No determination of the percentage of the semi-fibrous waste, above referred to, was made at the time the stripping experiments were conducted, Later, an approximate determination of the amount produced by a given stalk was arrived at in the following manner:—A complete stalk of abacá, weighing 15.876 kilos, was chopped into small pieces and subjected to hydraulic pressure. The dried residue weighed 1.592 kilos, so that the original stalks contained 10 per cent of vegetable matter and 90 per cent of water, calculated on the gross weight. In the case of the hand-stripped stalks only 2¼ per cent of these solids is accounted for. This loss of nearly 80 per cent, or four-fifths of the total solids of the stalk, caused us to collect and dry some of this waste material for a determination of its cellulose content. These and all subsequent digestion experiments were conducted on 1-kilo lots of dry material.

Experiment No. 1.—Strength of the caustic soda liquors, 2 per cent; 15 per cent of caustic soda calculated on dry weight of material treated; pressure, 6-8 atmospheres; time, 8 hours; yield 33 per cent; digestion, incomplete; residue, brown and coarse and only fit for cheap, colored wrappings.

Experiment No. 2—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on dry weight of material; pressure, 6-8 atmospheres; time, 8 hours; yield, 20.5 per cent; apparently well digested; light-gray residue.

Experiment. No. 3—Strength of liquor, 5 per cent; 45.5 per cent caustic soda calculated on dry weight of material; other conditions same as above; yield, 20 per cent.

From the above results we see that this waste is semi-fibrous. The time required, the pressure, and the strength of the caustic soda necessary to remove the cellulose portions of this waste will undoubtedly prohibit its use. No further experimentation with this material was made. For the manufacture of wrapping paper, where color is not so important as is strength and cheapness, the waste could be lime-boiled under pressure, and but partially bleached, as is done with jute.

Fibrous waste.—The waste material, which results from the present method of extraction of the fiber for cordage and textile purposes, consists essentially of broken, tangled, but clean, fibers mixed with strips or bands of fiber aggregates, from which the cellular and incrusting matter has not entirely been removed. Its cellulose content varies, being of course dependent upon the amount of these soluble constituents which are present. The readiness with which it is reduced to the condition of paper pulp, the kind and strength of chemicals required, and the time necessary for proper digestion likewise depend on this same factor. The fibrous waste was prepared for experimentation in much the same manner as old rope or rags are treated—namely, it was cut by hand into short pieces, thoroughly cleaned from all adhering sand and dirt and digested with caustic-soda liquor at elevated temperatures. The residues were drained and washed with hot water until they were free from alkali and the washings were colorless; they were then dried to constant weight in a water-jacketed air bath.

Experiment No. 1—Strength of liquor, 2 per cent; 17 per cent caustic soda calculated on weight of material digested, pressure, 6-8 atmospheres; time, 4½ hours; yield, 36.65 per cent; residue, brown gray in color, not entirely free from cellular matter.

Experiment No. 2—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on weight of material; pressure, 6-7 atmospheres; time, 4½ hours; yield, 32.84 per cent; well-cooked pulp of a light-gray color.

Experiment No. 3—Strength of liquor, 3¾ per cent; 30 per cent caustic soda calculated on weight of material; pressure, 6-7 atmospheres, time; 5 hours; yield, 31.7 per cent.

Experiment No. 4—Strength of liquor, 3⅜ per cent; 40 per cent caustic soda; other conditions same as No. 3; yield, 31.64 per cent.

Experiment No. 5—Five per cent liquor; 45½ per cent caustic soda; other conditions same as above; yield, 31.51 per cent.

The waste employed in the above experiments was obtained from a machine-stripping process. Reference to the table shows the relatively high percentage of dry machine waste as compared with the hand-stripped article. This explains the low cellulose content obtained. The experiments bring out the following points:—

First. Two per cent liquor is insufficient with the pressure and time employed.

Second. Three and three-fourths per cent liquor is as efficient as the stronger concentrations.

Third. The gradual but constant lowering of the yield in experiments 3, 4, and 5 is due to the fact that the stronger liquors attack the cellulose, but pressures of 6-7 atmospheres may safely be employed because, under these conditions, the solvent action is very slight.

The conditions of time, pressure, and strength of caustic soda which give the best results are approximately one-half of those employed in the manufacture of wood pulp by the soda process.

A second series of five digestions was made on abacá waste resulting from the hand process of extracting the fiber. The preliminary preparation of the material was the same as in the preceding experiments. In each case a 3⅛ per cent caustic soda solution was employed, 25 per cent caustic calculated on the weight of the material digested. The pressure was held for five hours at 6 atmospheres as a minimum and 7 atmospheres as a maximum. The yields were 38.89, 41.69, 42.59, 42.66, and 42.14 per cent, respectively. The resulting pulps were of a light-gray color and devoid of the harsh feel which comes from insufficient cooking.

For purposes of comparison, two specimens of old Manila rope, representing the extremes of quality of such material for paper manufacture, were examined.

Preliminary treatment.—The pieces of rope were cut down and thoroughly cleaned and dusted as is the practice in mills where such material is used.

Specimen No. 1.—A good grade of 1-inch rope but badly frayed and worn; lost 21 per cent in cleaning.

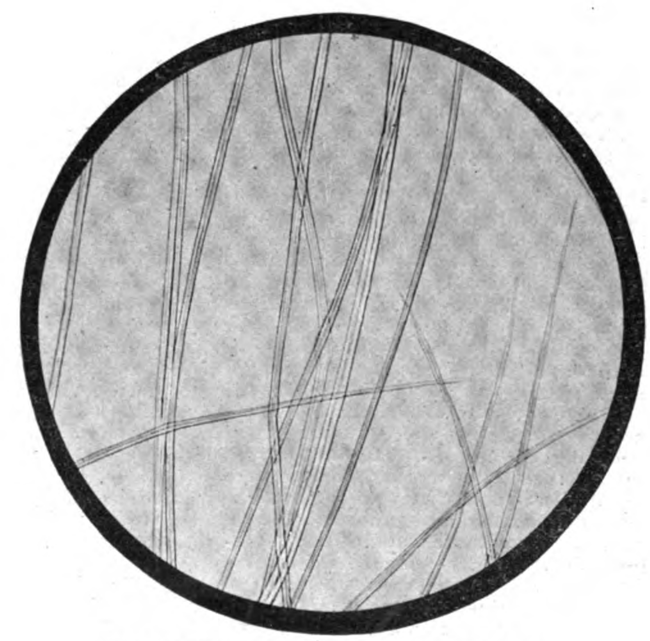
Experiment No. 1—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on weight of material digested; boiled 5 hours, at 6-8 atmospheres; yield, 61 per cent, equal to 48 7 per cent calculated on the original weight of rope.

Specimen No. 2—A very dirty one-half inch rope of native manufacture, containing some unstripped strands of abacá; lost 21.82 per cent in cleaning.

Experiment No. 2—All conditions of digestion same as above; yield, 43.89 per cent, equal to 34.31 per cent pulp, calculated on original weight of the rope.

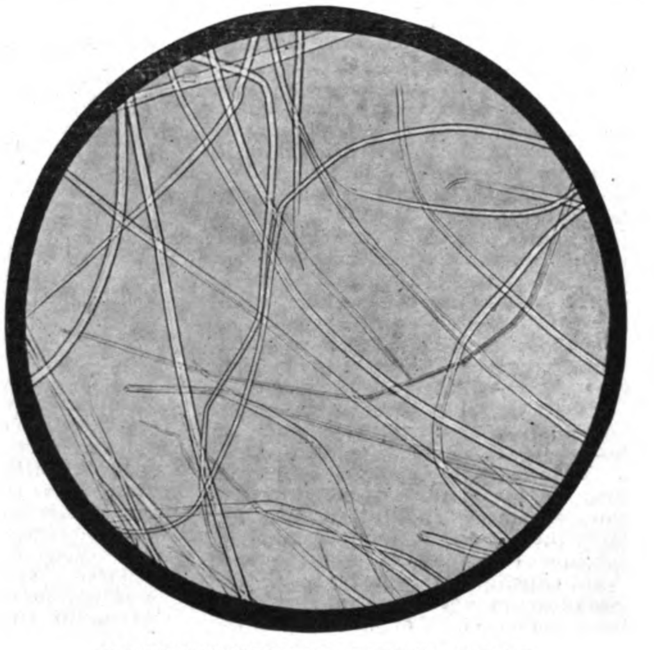
BLEACHING.—The operation of bleaching paper pulp as it is practiced under factory

TRANSVERSE SECTION OF PLANTAIN FIBERS



PLANTAIN FIBERS SEEN LONGITUDINALLY

TRANSVERSE SECTION OF MAGUEY FIBERS



MAGUEY FIBERS SEEN LONGITUDINALLY

conditions, where time is the important factor, is difficult to approximate in the laboratory. However, quantitative bleaching experiments allow of considerable accuracy and should afford fairly reliable data for comparative purposes under practical conditions.

Bleaching powder (chloride of lime) is used almost to the exclusion of all other agents, so that it alone need be considered. This chemical is usually applied in the form of a clear solution of approximately 5° Bé. strength (specific gravity, 1.036), made by disintegrating the powder in water and clearing it by allowing it to settle or by filtering. The amount of bleaching powder necessary to produce the required shade depends on several factors, chief among which is the completeness of the previous treatment—that is, the removal of the noncellulose. The kind of fiber to be bleached also materially affects the amount of bleaching agent required. It is the practice to base all calculations as to quantity upon the amount of bleaching powder required to bleach 45.4 kilos of the original fiber. The quantities in general use for this weight of different fibers are stated as follows:—

	Kilos.
Rags (cotton and linen fiber)	0.907- 2 268
Straw	3 175- 4 53
Esparto	4 53 - 6.80
Wood	5.44 -11.34
Jute and Manila	4.53 - 9.07

The pulp is bleached either in the beating machine or in large chests termed "plotchers." The exact procedure varies in the different mills, but time-saving devices and schemes are quite generally employed—that is, acid is added to hasten the bleaching action and artificial heat is supplied for the same reason. The following details of procedure, adopted for quantitative bleach experiments on abacá, apply as well to all the other fibers studied. It will be noted that all digestion experiments were performed on 1-kilo lots of raw material. This furnished in most instances about 450 grams of pulp. The washed, dry residues were repulped by beating or shaking with a definite volume of water, and a clear solution of bleaching powder of known strength was added, slightly in excess of the amount required to produce a good white. In some instances the operation was performed in a model beating engine of the Hollander type of about one-half kilo capacity, but most of the bleaching was done in 3-gallon glass jars provided with mechanical agitators. The experiments were conducted at ordinary temperatures (about 30° C.), and no attempt was made at "souring" by means of acids or of otherwise accelerating the action. The endeavor was rather to obtain a slow, regulated process which involved the least injury to the cellulose and a maximum yield of bleached pulp. After a good, white appearance was obtained to the beaten pulp, the stuff was filtered and the residual available chlorine determined by titrating an aliquot portion of the filtrate with a standard solution of thiosulphate. The filtering and washing of the bleached cellulose was performed by means of suction, a large Buchner funnel with small perforations proving a very efficient mold in which to wash and press the pulp into discs for a final weighing.

BLEACHING ABACÁ PULP.—*Experiment No.* 1.—The dry residue from digestion No. 2, amounting to 328.4 grams, was placed in the engine and beaten to a homogeneous mass with 9 liters of water, then 2½ liters of clear bleaching powder solution, strength 2.35 per cent available chlorine (approximately 10° Bé.) were run in and the stirring continued until the pulp was of a light cream color. At this stage 100 cubic centimeters of the liquor required 31 cubic centimeters of N/10 thiosulphate, equivalent to 0.11 gram of chlorine, or to 12.1 grams of residual chlorine in the entire liquor. The amount of chlorine added (2½ liters of (2 35 per cent chlorine solution) was 58.75 grams. The difference between this quantity and the 12.1 grams remaining at the end of the bleach, amounting to 46.65 grams, represents the amount used in bleaching 324 8 grams of pulp or 1,000 grams of original waste. This is 14.2 per cent of chlorine, calculated on the weight of pulp, or 4.66 per cent calculated on the weight of the raw material originally taken. Using bleaching powder of 35 per cent available chlorine as a basis for calculating into terms of general usage, the above results are equivalent to 14.2 per cent of powder. The dry, bleached residue weighed 304.4 grams, so that there was a loss of 7.3 per cent in the bleaching operation.

Experiment No 2.—The residue from digestion No. 3, page. 445 weighing 317 grams was employed. A bleach liquor of much less strength (1.65 per cent available chlorine, approximately 3½° Bé.) was used, otherwise the conditions were the same as in the preceding experiment. The amount of bleaching powder required was 12.22 per cent of the raw material. The dry bleached residue weighed 297 grams, so that there was a loss of 6.4 per cent in bleaching.

DIRT AND FOREIGN MATTER IN ABACA WASTE.—The cleanness of the raw material is an important consideration with paper makers. Foreign substances, such as sand, do not disappear in the pulping process and appear to be multiplied in the bleached and beaten half stuff.

In this respect abacá waste as it is ordinarily collected becomes very much contaminated. The greater part of this accumulation of foreign matter can be avoided if extra care is taken in the stripping of the fibers, but even then the waste would need to be thoroughly dusted at the factory and either picked over by hand or cleaned by machinery, according to the methods used for the preparation of dirty rags and rope.

The Philippine Islands are the home of real Manila paper stock. The qualities which give to abacá its prominent position among the fibers of the world—*i. e.*, its strength and durability—make it a source of paper stock par excellence. The same conditions which confront paper manufacturers in other parts of the world are to be met here. The material must be collected from widely scattered localities, but with improved means of transportation it seems possible that this waste from abacá could be baled and shipped to market along with the cordage fiber. This will soon be the case when it becomes generally known that a product which has hitherto been a total loss will command from 1 to 2 cents a pound and the result will be to augment the revenues of the Manila hemp industry by millions of dollars annually.

PLANTAINS AND BANANAS.—Two other species of the family of plants to which abacá belongs, namely, the banana *(Musa sapientum)* and plantain *(Musa paradisiaca)*, are worth considering in regard to their availability for paper stock. The Philippines and the Indian Archipelago are regarded as the regions richest in bananas.

This highly important fruit grows in every province and inhabited island of the Philippines, both in the wild and cultivated state, and numbers over fifty species. The statistics regarding its production and area are interesting only as indicating the extent to which the natural, spontaneous growth has been supplemented and added to by such industry as the natives have exerted in setting out plants in the vicinity of their houses, which after planting receive very little, if any, attention in the way of real cultivation.

MAGUEY *(Agave cantula)*.—After abacá, maguey or sisal hemp may well be ranked as the second most important fiber-producing plant of the Philippine Islands. The maguey plant is widely distributed throughout the Archipelago and has long been used for local purposes.

The structural fiber of this and other species of *Agave* is used for cordage and like abacá, it finds its way to the paper mills in the form of old rope, binder twine, etc.

MAGUEY WASTE.—The waste fiber employed for the following digestion experiments was taken during some machine-stripping tests which were made on maguey leaves from Vigan, Ilocos Sur, by the Bureau of Agriculture of the Philippine Islands. The possibility of materially reducing the weight and bulk of this waste material by boiling it with lime in the localities where it is produced suggested itself, and experiments to decide this question were first undertaken.

Experiment No. 1.—One kilo of partially cleaned, dry waste was boiled in an open kettle for twelve hours with 20 per cent of quicklime calculated on the weight of the material. The washed, dry residue weighed 685 grams, or 68.5 per cent. The residue was unpulped, of a dark-brown color, and very coarse. Digested for five hours longer, under 6-7 atmospheres pressure with 10 per cent caustic soda calculated on the original weight taken. The

yield was 31.5 per cent of a light-gray, well digested pulp.

Experiment No. 2.—Uncleaned waste; 20 per cent quicklime; time of digestion, five hours; pressure, 6-7 atmospheres; yield, 55 per cent of a coarse, brown residue only suitable for cheap wrapping paper.

Experiment No. 3.—Time of digestion, twelve hours; all other conditions as in experiment 2; yield, 38 per cent. The residue appeared to be well pulped, but not entirely free from cellular matter.

Experiment No 4.—Twenty-five per cent caustic soda, calculated on the weight of material digested; time, five hours; pressure, 7 atmospheres; yield, 35 per cent; residue, light-gray, and it appeared to be very well boiled.

Experiment No 5.—Twenty per cent caustic soda, time, five hours; pressure, 7 atmospheres; yield 41.5 per cent; residue, dark-gray; digestion, in complete.

Experiment No. 6.—Twenty per cent caustic soda; boiled twenty-four hours at ordinary pressure with reflux; yield, 50 per cent; residue similar to that from experiment 2.

Conclusions.—For the preparation of half stuff for brown wrapping paper the waste may be lime boiled under pressure with good results both in respect to yield and to economy; however, an open cook with lime gave negative results. The weight of he wtste mty be reduced by about 30 per cent by this latter procedure, but the resulting product is not in any sense a paper pulp. Caustic soda (25 per cent calculated on the gross weight of the material) effects a complete re-solution of the incrusting material.

BOWSTRING HEMP.—*Sanseveria zeylanica* is found quite widely distributed throughout the Islands and is cultivated in some localities for cordage and textile purposes. It is mentioned in this place because of the similarity which its structural fiber has to that of maguey and because of the possibility of its becoming a plant of considerable commercial importance. Like maguey, it readily lends itself to machine stripping and in the event of a more extensive cultivation the waste fiber may be worth considering.

PHILIPPINE GRASSES.—The following statistics which refer to the paper industry of India are specially significant in their bearing on the possibilities of paper production in the Philippines, as the raw materials in general use in the mills of India are very similar to those which we are about to discuss:—

There are eight paper mills in operation, two of which are private concerns. The capital invested so far as information is obtainable is rupees 7,320,000 (approximately $2,500,000 gold). Most of the white and blue foolscap and much of the blotting paper, note paper, and envelopes used in the Government offices are now made in the Indian mills.

The total quantity of paper made in 1902 was 47,000,000 lbs., valued at $2,092,000 gold, approximately. The capital has trebled in twenty years since 1863 and the production and number of persons employed has increased sixfold during the same period.

Cogon.—Two grasses, cogon and taláhib, are found in the Philippine Islands growing wild and apparently in sufficient quantities to warrant some inquiry as to their economic use. In the Philippines many coarse grasses are termed cogon, but, properly speaking, cogon (*Imperata exaltata* Brong.) is the broad-leaved, gregarious variety, 2 to 4′ in height, which grows in even stands on open lands, foothills, and mountains. Where nipa is not to be obtained the true cogon is highly prized for thatching purposes. Conditions of drought do not appear to affect its growth, as it seems to thrive on a soil containing but little moisture; indeed, even in the driest season it will spring up in a green and thrifty manner after being burned over, while, on the other hand, it is not found along river bottoms or on lands subjected to overflow during the rainy season. The study of cogon grass was conducted in conjunction with that of esparto in this laboratory because the use to which it is proposed to put the former is identical with that established for the latter. A direct comparison is therefore important and necessary, We are furnished with the Spanish variety of esparto from Barcelona through the kindness of Don Enrique Zobel, of Manila, and of the Compañía General de Tabacos de Filipinas.

Ash, alkaline hydrolysis, and cellulose calculated on dry material.

	COGON GRASS.	ESPARTO GRASS (SPANISH).
	Per cent.	Per cent.
Moisture	9.82	8.68
Ash	4.53	3.71
Hydrolysis (*a*)	25.77	19.75
Hydrolysis (*b*)	40.00	37.16
Cellulose	50.11	55 16

Chemical composition of cogon and esparto grass.

	COGON.	ESPARTO.
	Per cent.	Per cent.
Cellulose	46.68	48 25
Fat and wax	1.16	2.07
Aqueous extract	10.80	10.19
Pectous substances	26	26.39
Water	11.38	9.38
Ash	4.03	3.72

Experimental work with mature cogon grass, the results of which are given below, indicates, first, the yield of paper cellulose to be expected under factory conditions of treatment; second, the approximate amount of caustic soda necessary to produce a well-boiled pulp; third, the comparative, resistant nature of the cellulose to further hydrolysis.

Percentage of—	Experiment 1.	Experiment 2.	Experiment 3.	Experiment 4.
Soda liquor.......	2	2.4	2.5	3
Caustic calculated on weight of material............	10	12	12 5	15
Yield of pulp......	47.34	45 5	45.42	44.25

All four of the pulps were light-gray in color and they appeared to be well reduced. The digestions were carried out in an autoclave built of bronze and the heating was done with direct fire. By the use of patent boilers of the vomiting type and by heating with direct steam (improvements which are in general use with esparto grass) results equal to those given above could no doubt be brought about in a much shorter time. The pulp has a great tendency to form little balls which are very similar to those encountered with esparto and straw, hence rotary boilers would not be suitable. The modern tendency is either to increase the pressure or the amount of caustic soda used, thus diminishing the duration of the digestion.

Two digestions with 2 per cent liquor, but with 20 per cent caustic soda, calculated on the weight of the material, were carried out at 4 to 5 atmospheres pressure for three hours. The yields of pulp were 44 and 45 per cent, respectively.

In some cases, esparto and straw are boiled in open kettles, but if this is done, a much longer time is required to accomplish the same result. The following table gives the results of two such experiments:

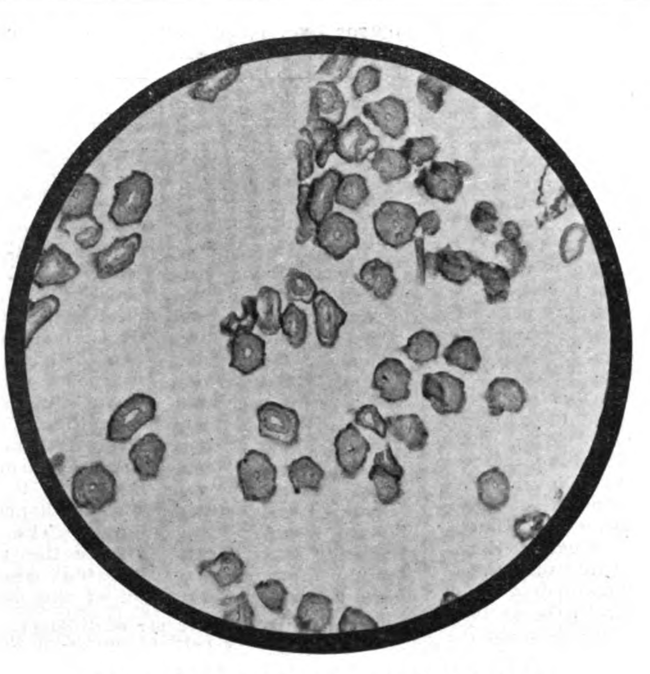
Digest'on of cogon at ordinary pressures.

	I.	II.
Strength of liquor (per cent)	2.6	3
Caustic soda (per cent)	13	15
Time of boiling (hours)	12	12
Yield of pulp (per cent)	51.25	48.81

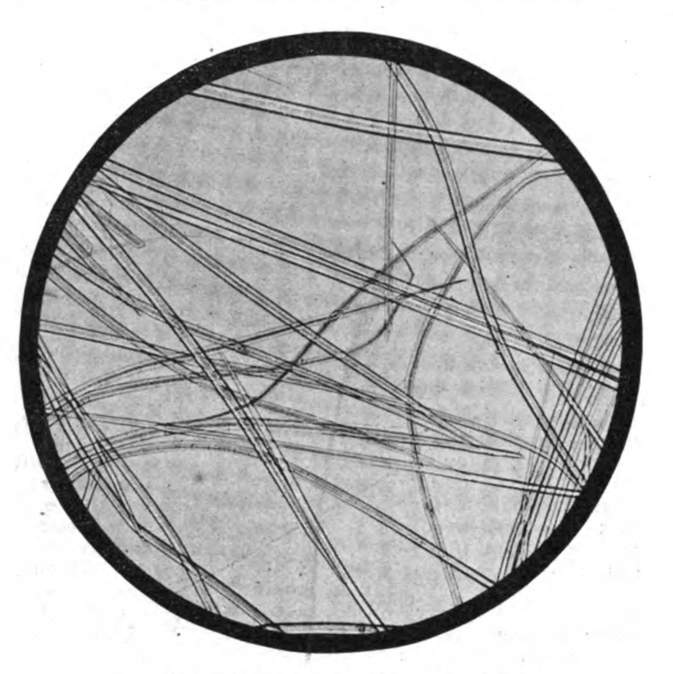
These results show that cogon could be boiled in open digesters with good results, to make the cheaper grades of printing paper, where time is not as important a factor as the cost of the process. The use of quicklime, the chemical so commonly employed in the manufacture of strawboard, did not give satisfactory results with cogon grass because the lime seems to combine with the soluble constituents from the grass and it then becomes extremely difficult to wash out. The pulps produced in this manner in the laboratory were coarse and brown. However, for the cheapest printing paper and for boards, a lime boiling in an open cook, or perhaps under 1 to 3 atmospheres pressure, would effect great saving in the cost of the chemicals to be used.

TRANSVERSE SECTION OF COGON FIBERS

COGON FIBERS SEEN LONGITUDINALLY



TRANSVERSE SECTION OF TALÁHIB FIBERS



TALÁHIB FIBERS SEEN LONGITUDINALLY

The investigation of cogon also proved that no preliminary cutting down of the grass is necessary; after being dried and hand picked or machine cleaned it is fit for immediate digestion.

BLEACHING OF COGON GRASS FULP.—*Exper'ment No* 1.—The residue from digestion No. 3, page 458, amounting to 454.2 grams, was repulped in 10 liters of water; 1 liter of a bleaching solution of 2.35 per cent available chlorine (approximately 10° Bé.) was added and the whole allowed to bleach over night. No residual chlorine remained, but the pulp was of a clear, white color. The amount of chlorine consumed was 23.5 grams (1,000 cubic centimeters of 23.5 per cent solution). This represents 67.1 grams of powder, equivalent to 67.1 per cent. The bleached pulp weighed 428.7 grams, which gave a loss of 5.62 per cent bleaching.

Experiment No. 2.—A residue from digestion with 20 per cent caustic soda, page 4?9, amounting to 440 grams, was submitted to exactly the same conditions as those given above. The residual chlorine amounted to 0.78 gram, which leaves 22.72 grams as the amount consumed. This represents 64.9 grams of powder. The bleached pulp weighed 418 grams which represents a loss of 5 per cent in bleaching.

This is a coarse-jointed grass, 6 to 10′ in height, gregarious, growing in tufts from stout underground rootstalks. It is found to be distributed from British India to southern China, Malasia, New Guinea, the Philippine and Caroline Islands. It is very common throughout the Archipelago and is frequently confounded with cogon grass, but it is very distinct from the latter in appearance and in its habit of growth. It thrives best in valleys and in low, moist places, especially in areas which are flooded during the rainy season. It is very persistent and difficult to eradicate; simple cutting or burning does not appear to decrease its growth but rather to improve its yield and quality. Other related species are *Saccharum sara* (the Munj grass of India) and *Saccharum officinarum* (the well-known sugar cane of all tropical countries). A sample of mature grass consisting of entire stems and leaves gave the following figures:—

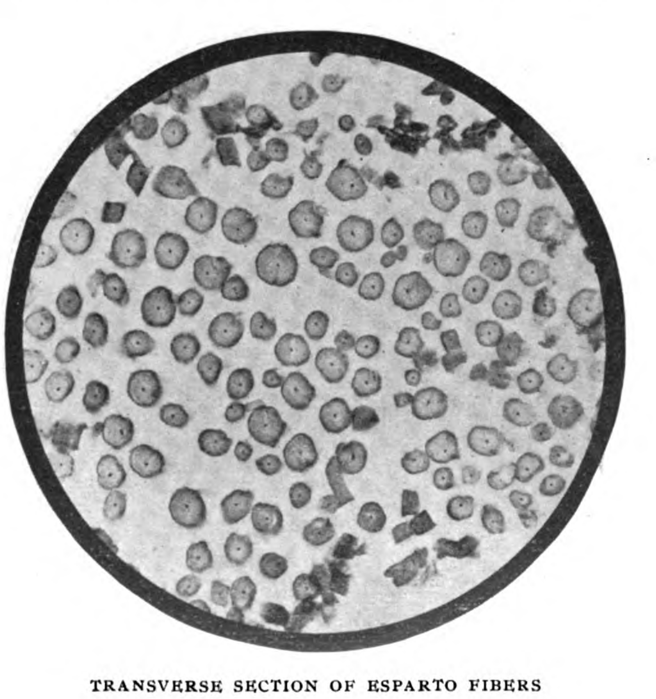
	Per cent.
Moisture	10.23
Ash	5.46
Hydrolysis *(a)*	27.44
Hydrolysis *(b)*	40.53
Cellulose	53.90

If this grass is allowed to become too dry before cutting, the nodes harden and prove difficult to pulp, and a considerable quantity of shive is the result, so that some mechanical crushing or breaking of the stems is necessary. Only one digestion experiment was made. The grass was cut into short pieces and boiled in water for three hours to soften the nodes, then digested during six hours with 12½ per cent of caustic soda, calculated on the weight of the grass. Pressure, 4 to 5 atmospheres. Yield of pulp was 45.57 per cent. The residue bleached to a good white with only 3.2 per cent loss in weight by the use of 5.7 per cent of bleaching powder, calculated on the original weight of the material digested.

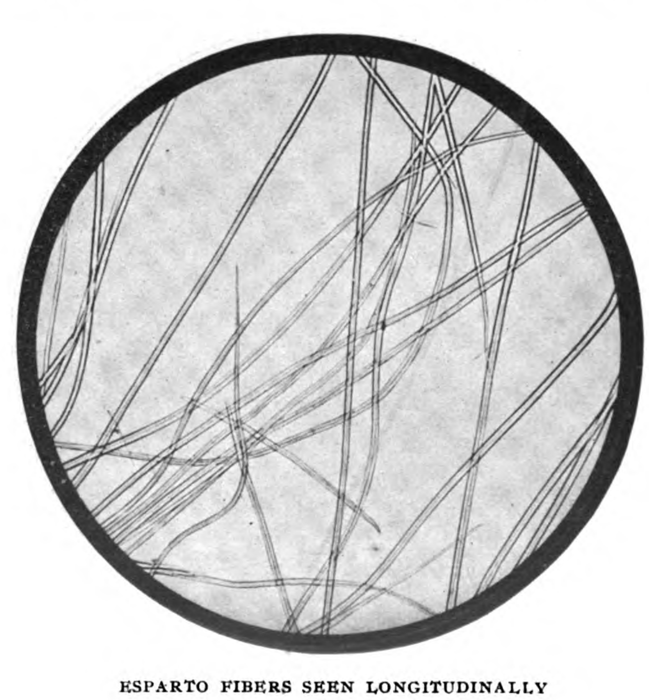
DIMENSIONS OF THE ULTIMATE FIBERS OF SOME PHILIPPINE FIBER PLANTS.

[Table by Dr. E. B. Copeland. All measurements are in millimeters.]

Name.	Length.			Diameter. Total.			Diameter. Lumen.		
	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum
Abacá (*Musa textilis*)	6.00	3.98	2,45	.021	.017	....	.009	.0066	....



TRANSVERSE SECTION OF ESPARTO FIBERS



ESPARTO FIBERS SEEN LONGITUDINALLY

COGON GRASS PAPER

ABACÁ-WASTE PAPER

Plantain (*Musa sapientum* var. *paradisiaca*)	7.80	5.49	4.15	.026	.020	.018	.016	.0106	. 007
Maguey (*Agave cantula*)	4.93	2.88	1.00	.026	.018	.015	.013	.007	. 004
Cogon grass (*Imperata exaltata*)	1.82	0.99	0.46	.021	.011	.005	.013	.0014	. 001
Talahib grass (*Saccharum spontaneum*)	2.82	1.59	0 80	.020	.015	.012	.010	.0013	.1115
Bamboo (*Bambusa blumeana*)	....	1.81	....	....	.0075	....	....	....	....
Dwarf bamboo (*Bambusa lumanpao*)	4.10	2 57	1.20	.028	.0156	.005	.025	. 018	.001
Rice straw (*Oryza sativa*)	....	0.88	....	....	.0025	....	....	....	....
Buri palm (*Corypha umbraculifera*)	2.80	2.11	1.10	.015	.013	.010	.007	.0034	.002

Table of dimensions of some of the more important fibers used in the manufacture of textiles and paper.

[Taken from M. Vetillart.]

Name.	Length of fiber cell. Maximum	Mean	Minimum	Diameter of fiber cell. Maximum	Mean	Minimum
Flax (*Linum usitatissimum*)	66.0	25-30	0 4.0	0.037	0.022	0.015
Hemp (*Cannabis sativa*)	55 0	22 0	5 0	.050	.022	.016
Jute (*Corchorus olitorius*)	5.0	2 0	1.3	.025	.020	.020
Esparto grass (*Stipa tenacissima*)	3 5	0.5	1 3	.018	.0125	.007
Spanish grass (*Lygeum spartum*)	4.5	2 5	1.3	.020	.016	.012
Bowstring hemp (*Sanseveria sp*)	6.0	3.0	1.5	.026	.020	.015
Paper mulberry (*Broussonetia papyrifera*)	25.0	15.0	6.0	.035	.030	025
Talipot palm (*Corypha umbraculifera*)	5.0	3.0	1.5	.028	.024	.016
Coconut palm (*Cocos nucifera*)	1.0	7.0	0.4	.024	.020	.01

REMARKABLE STEAMSHIP RECORD

The White Star flag, which floated at the masthead of the steamers *Doric* and *Coptic* for many years, has abandoned the Pacific Ocean. Until recently these ships were owned by the White Star people, although they were operated, under charter, by the Occidental and Oriental Steamship Company of San Francisco. Both ships are now owned by Americans, presumably, they having recently passed over to the ostensible proprietorship of the Pacific Mail.

In this connection some facts about the remarkable career of the *Doric* since she sailed from Liverpool, January 16th, 1896, for the Pacific trade, may prove interesting to mariners. She arrived at San Francisco on her maiden voyage from England, February 26th, 1896, and docked in berth the following day. Her steaming time from port to port was 41¼ days. The distance run was 13,600 knots (about 330 knots per day), and during the whole voyage she made but one stop of 50 mins. for the repacking of a high-pressure gland, and was delayed about 6 hrs. awaiting daylight at Sandy Point, Straits of Magellan. It will be difficult to find a record to equal the one made by the *Doric* on this maiden trip in view of the fact that her engines and boilers were new, having had a trial trip of only 4 hrs. previous to her sailing from Liverpool.

After laying at San Francisco about a week the *Doric* began her career in the Occidental and Oriental service, sailing from the Pacific Coast port for Oriental harbors March 5th, 1896, and during her service under the White Star flag she faithfully did her work. The following résumé of work done by her engines should interest the marine engineers. In 10 yrs. and 4 mos.—or better still, in 50 round voyages to the Orient,—divided into five periods of 10 voyages each, the results are as follows:—

1st period	= 10,050 hrs.	= under weight;	142,509 knots,	14.18 knots per hr.;	5¼ per cent slip;	72 tons per day
2d "	= 10,541 "	= " "	150,046 "	14 23 " " "	5⅓ " " "	73⅓ " " "
3d "	= 10,752 "	= " "	151,208 "	14 " " "	4¾ " " "	72¾ " " "
4th "	= 10,891 "	= " "	152,325 "	14 " " "	6 " " "	72 " " "
5th "	= 10,941 "	= " "	153,052 "	14 " " "	5? " " "	77 " " "
50 voyages	= 53,175 "	= " "	149,140 "	14 " " "	5½ " " "	73½ " " "

Coals were of very inferior quality during the 5th period, and the ship's average speed includes all slows in fogs and all stoppages. For a 14-knot steamer, therefore, the record is most excellent.

IMPORTANT SHIPBUILDING CONTRACTS

On September 27th, proposals for constructing four vessels for the Quartermaster's Department of the U. S. Army, in the Philippine Islands, were opened in Manila by Captain W. S. Scott, Quartermaster, in charge of water transportation. The Hongkong and Whampoa Dock Company, Ltd., of Hongkong, and the Shanghai Dock and Engineering Company, Ltd., of Shanghai, submitted the only tenders covering all the work, although there were four other bids on part of the contracts. The Hongkong concern secured three of the four jobs. The bids were as follows:—

Sea-going tug.—Hongkong and Whampoa Dock Company, $86,280, to be completed in 9½ mos.; Shanghai Dock and Engineering Company $105,376, to be completed in 10 mos.; Findlay & Co., Manila, $106,885, to be completed in 10 mos.; Uraga (Japan) Dock Company. $109,500, to be completed in 380 days.

Steel launch.—Hongkong and Whampoa Dock Company, $17,540, to be completed in 7½ mos.; Shanghai Dock and Engineering Company, $19,980, to be completed in 8 mos. (Charles S. Robinson, Manila, proposed to sell a launch for $5,500, which was rejected.)

Stern-wheel steamer.—Hongkong and Whampoa Dock Company, $12,146, to be completed in 7½ mos.; Shanghai Dock and Engineering Company, $39,220, to be completed in 8 mos.

Hull for steam launch.—Hongkong and Whampoa Dock Company, $25,440, to be completed in 8½ mos.; Shanghai Dock and Engineering Company, $15,540, to be completed in 8 mos.; El Varadero, Manila, $8,600, to be completed in 5 mos. This contract was secured by the Manila concern.

JAVANESE FOR INDO-CHINA

M. Hardouin, French Consul, was recently sent to Java by M. Beau to study the question of whether Javanese labor, used so successfully in New Caledonia, could be introduced into Indo-China. Since his return he has communicated his conclusions to the Chamber of Agriculture of Cochin China. They are very favorable, and the planters of Cochin China appear disposed to make the experiment. At the same time, although a large tract of territory still remains uncultivated in that country, the Annamite population is developing with a sufficient rapidity, so that it may perhaps be wise to leave this reserve to them. It would be a different thing in Cambodia, where the population is extremely scattered.—*The London and China Express.*

PHILIPPINE MINERS ORGANIZE

The Philippine Miners' Promotion Association has been organized in Manila for the purpose of disseminating literature throughout the Islands and in the United States setting forth the general mineral resources of the archipelago. The officers are as follows:—Governor-General James F. Smith, honorary president; George Landers, president; M. A. Clarke, vice-president; H. B. McCoy, 2d vice-president; C. E. Hamilton, 3d vice-president; Captain Collette, 4th vice-president; George Morgan, treasurer; Chauncey McGovern secretary.

"THE COMMERCIAL ORIENT IN 1905"

(By *Walter J. Ballard*, Los Angeles, Cal., U. S. A.)

The Commercial Orient in 1905 is the title of a monograph just issued by the Bureau of Statistics of the Department of Commerce and Labor, at Washington.

From it we learn that the population of the Orient is 911,200,000; that the total imports amount each year to $1,707,000,000; that American goods form $128,100,000 of those imports, or only 7.5 per cent.; that the same countries have yearly exports of $1,616,700,000, of which the United States takes a total of $155,800,000, or 9.6 per cent.

Here are the countries and the figures for 1905 in the order of imports:—

	Population	Imports	American sales.
China	426,300,000	$ 326,400,000	$56,100,000
British India	294,400,000	300,200,000	4,100,000
Japan	46,700,000	243,300,000	51,900,000
Straits Settlements	600,000	168,300,000	1,100,000
Egypt	9,700,000	106,600,000	2,400,000
Turkey	24,000,000	101,200,000	1,100,000
Algiers	4,700,000	70,900,000	600,000
Dutch East Indies	35,700,000	70,200,000	900,000
British East Indies	700,000	41,900,000	200,000
Ceylon	3,700,000	37,800,000	200,000
French Indo-China	18,000,000	35,700,000	
Malta	200,000	3,480,000	
Philippine Islands	8,000,000	30,900,000	5,800,000
Persia	9,500,000	27,700,000	500,000
Malay States	800,000	21,400,000	
Siam	6,000,000	21,300,000	
Tunis	1,900,000	16,100,000	200,000
Aden		13,600,000	1,400,000
Korea	12,000,000	13,200,000	900,000
Formosa	2,800,000	11,500,000	700,000
Morocco	5,000,000	10,500,000	
Cyprus	200,000	2,300,000	
French East Indies	300,000	1,100,000	
Totals	911,200,000	$1,707,000,000	$128,100,000

	Exports in 1905.	American purchases.
British India	$496,300,000	$29,400,000
China	166,400,000	19,700,00
Japan	160,100,000	46,800,00
Straits Settlements	142,600,000	16,000,000
Dutch East Indies	109,700,000	7,600,000
Egypt	100,000,000	6,200,000
Turkey	63,300,000	7,900,000
British East Indies	58,500,000	
Algiers	52,500,000	200,000
Malay States	35,400,000	
Ceylon	33,800,000	2,700,000
Philippine Islands	32,400,000	15,700,000
French Indo-China	30,200,000	
Malta	29,900,000	
Siam	27,500,000	
Persia	18,300,000	
Tunis	13,800,000	
Aden	11800,000	1,900,000
Formosa	11,400,000	1,400,000
Morocco	7,000,000	300,000
Korea	5,900,000	
French Indies	5,900,000	
Cyprus	2,400,000	
Totals	$1,615,700,000	$155,800,000

From our standpoint the anomalies are—

	We buy.	We sell only.
Ceylon	$2,700,000	$200,000
Formosa	1,400,000	700,000
Dutch East Indies	7,600,000	900,000
Egypt	6,200,000	2,400,000
Turkey	7,900,000	1,100,000
British India	29,400,000	4,100,000
Straits Settlements	16,000,000	1,100,000
Philippine Islands	15,700,000	5,800,000
Morocco	300,000	
Totals	$87,200,000	$16,300,000

Thus we buy five and one-half times as much as we sell in our trade with the nine Oriental countries. That is not by any means a profitable American proposition.

Then again, we do not sell a dollar's worth to eight of the entire list of Oriental countries named.

The section of the world occupied by people of Oriental habits includes all of Northern Africa, Turkey in Europe as well as Asia, all of Southern and Eastern Asia and the East Indian Islands. This territory, stretching from North Africa to the East Indies and occupied by Oriental people, is about one-fifth of the land surface of the globe, but its population is more than half the people of the entire world.

Yet to this vast aggregation of people—911,200,000—we are selling only $128,100,000 worth of goods yearly—about fourteen cents per capita—while we buy $155,800,000 worth —or about seventeen cents per capita.

Evidently American exporters have hardly yet touched the fringe of the Orient's import garment.

It must be borne in mind by American manufacturers that in order to do the business of the Orient goods must be made in a manner and style which conform to the habits of life in a tropical climate, and no reliance must be placed on their using the manufactures which we usually make, mostly suited, as they are, to dwellers in the temperate zones. We must study the wants of an Oriental tropical zone people to sell them goods in any great quantity.

In a few articles absolutely necessary, such as mineral oils for lighting, the Oriental has adapted himself, says the Bureau of Statistics, to the ways of the Occident, but the very large proportion of articles offered he declines unless they are so prepared as to meet the habits of life to which he and his fathers before him have been accustomed. Experienced European manufacturers and exporters understand this. That is why they are able to sell sixty-six per cent of the $1,000,000,000 worth of goods which the Orient imports from the Occident yearly, and are steadily increasing their sales, while the United States sells only one per cent and practically makes no increase in its total. Yet a large part of the $650,000,000 worth of goods which Europe sells annually to the Orient consists of goods of a character which the United States can readilly produce. Why we are not producing them is the problem for American manufacturers and exporters to solve, and act accordingly.

In that part of the Orient lying in the temperate zone American exports are progressing along certain limited lines. In cotton goods, mineral oils and copper for China, says the monograph, and machinery, railway supplies, manufactures of iron and steel, and flour for Japan and Korea, the United States is rapidly developing its sales. North China can wear the heavy cottons we generally make. South China, however, relies upon Europe for the light cottons it needs in its subtropical climate. In mineral oils, needed everywhere, our sales are fairly uniform all over the Orient, except where the oils of Russia and Sumatra are produced in too close proximity for American oil competition. China's new copper coinage calls for our copper as the most suitable. Japan's railroad and factory building benefits us chiefly by reason of our market being nearer to her than that of Europe. A growing taste in Japan for flour, coupled with her rice shortage of recent years, brings the demand now upon our Pacific coast ports for that commodity.

The $1,000,000,000 market in the Orient for Occidental goods is practically made up of the following:—

Cotton goods	$250,000,000
Iron and steel	100,000,000
Provisions	40,000,000
Mineral oils	40,000,000
Medicines, drugs and dyes	25,000,000
Flour	20,000,000
Other manufactures	505,000,000
Coal	20,000,000

Again, Europe is able, through her banking institutions in the Orient, often to beat us by offering more liberal terms of credit. The banking use in the Orient of some of our many millions of idle dollars would materially pave the way for a large increase in our exports to the Orient, just as the German and British banks are doing for German and British exports, not only in the Orient but also in South and Central America. Exports are a science and should be studied as such, not merely as a haphazard means of dumping surplus stocks. The opportunity is ours for the grasping.

PHILIPPINE TIMBER INDUSTRY

Major George P. Ahern, U. S. Army, Director of Forestry for the Philippine Government, has forwarded the following recommendations to the Secretary of the Interior, which are self-explanatory:—

The *Forest Act* (*Sections* 11 *and* 12) provides for two scales of charges on timber taken from public lands. In provinces in Class A the charges are almost double those imposed in provinces in Class B. This difference in charge has been an incentive to timber licensees to confine their logging operations to provinces in Class B, where the stand of timber is large and where extensive logging operations can be carried on without detriment to the forest. Almost all of the larger operators are now located in Class B provinces. The operations in the other provinces are usually carried on to supply the local demand, with three exceptions, *viz:* The provinces of Bataan, Bulacan and Zambales. In these provinces timber is cut for the Manila market.

The forests in Class A provinces have been severely cut over in times past and need protection, which can now be provided without the aid of additional charges.

Although the present scale of Government charges on timber in Class A provinces is below similar scales of charges for woods of the same quality in India and Java, I believe that, in view of the poverty of the people, the difficulties of transportation and the need of timber for all classes of construction in these Islands, we can afford at this time to make the change. The following change is respectfully recommended:—

That *Sections* 11 and 12 *of the Forest Act* (No. 1148) be amended to eliminate the mention of classes of provinces, and that but one scale of charges on timber be imposed, and that the scale of charges imposed in Class B provinces be adopted for all provinces. If this recommendation be approved, *Sections* 11 and 12, as amended, will read as follows:—

Sec. 11. For the purposes of this Act the various native trees are divided into four groups:

The first group shall include acle, betis, baticulin, camagón, ebony, ipil, lanete, mancono, molave, narra, tindalo, and yacal.

The second group shall include alupag, aranga, banaba, bansalaguin, banuyo, batitinan, bolongeta, calamansanay, calantas, dungon, guijo, macaasin, malacadios, mangachapuy, palo Maria, supa, teak and tucancalao.

The third group shall include agoho, amuguis, anubing, apitong, batino, bitanhol, catmon, calumpit, cupang, dalinsi, dita, dungonlate, malacmalac, malapapaya, malasantol, mayapis, nato, palosapis, panao, sacat, santol, tamayuan, and tanguile.

The fourth group shall include anahao, anam, apuit, bacao, balacat, balinhasay, batete, bayoc, bonga, bulao, lauan, malaanonang, malabalac, malabonga, mangasinoro, manicnic, pagatpat, and pagsainguin.

Sec. 12. The metric system of weights and measures, as adopted by the *Revised Statutes of the United States*, shall be used.

On each cubic meter of timber which may be cut in any public forest or forest reserve in any of the provinces of the Philippine Islands for domestic sale or consumption, or for export, there shall be paid, within 30 days from date of the receipt by the owner or his agent of the order of payment of the Government charge on the same, into the insular treasury, as provided by existing law, the following sums:—

On all timber included in the first group ₱2.50.
On all timber included in the second group ₱1.50.
On all timber included in the third group ₱1.00.
On all timber included in the fourth group and on all non-enumerated timber ₱0.50:—

Provided, That the taxes imposed in this section on ebony and camagon shall be charged on said timbers when presented for measurement and appraisal with the sapwood still attached; and the number of cubic meters in each piece of timber so measured shall include the sapwood attached to the same, and when ebony or camagon timber from which the sapwood has been stripped is presented for measurement and appraisal, there shall be assessed and collected the following sums:

On each cubic meter of ebony ₱6. On each cubic meter of camagon ₱4.50.

The volume of all round timber shall be ascertained by multiplying the area of the small end by the length of the log. The volume of all squared timber shall be ascertained by multiplying the average cross section by the length, to which twenty-five per centum shall be added for loss in squaring. The volume of all sawn timber shall be ascertained by multiplying the average cross section by the length, to which fifteen per centum shall be added for loss in sawing.

All timber included in the preceding section in the third and fourth groups and all nonenumerated timber cut in any province, known in the market under the name of "raja" and which shall not exceed one and one-half meters in length and fifteen centimeters in diameter, shall be classed as firewood, and the following taxes shall be collected thereon:

On all firewood consisting of "rajas," from 60 cm. to 1½ met. in length, and from 7 cm. to 15 cm. in diameter, for each 1,000 "rajas."

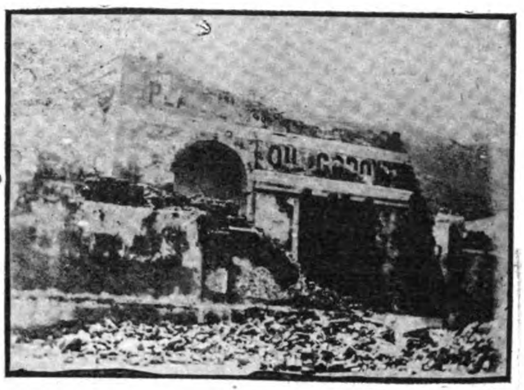
On all firewood consisting of pieces of timber less than 60 cm. in length and less than 7 cm. in diameter, ₱0.10 per cu. met.: *Provided*, That whenever in the opinion of the chief of the Bureau of Forestry the preservation and use of the public forests and forest reserves shall render necessary the removal of the tops of fallen timber, said tops when removed in accordance with the regulations prescribed by the chief of the Bureau of Forestry, shall be exempted from the payment of any tax imposed in this section on timber or fire wood or other products.

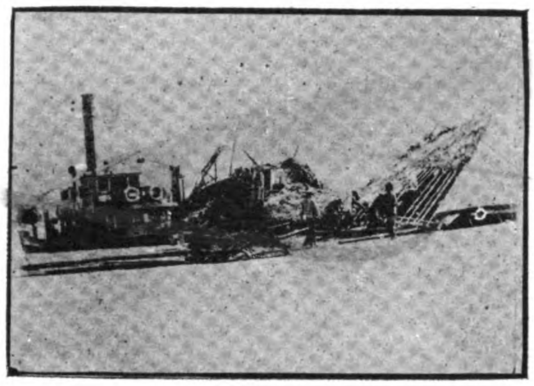
On all gums and resins and other forest products gathered or removed from any province there shall be paid on the actual market value thereof 10 *per centum*. The collector of Internal Revenue and the chief of the Bureau of Forestry shall upon the passage of this Act, and from time to time thereafter, make a joint assessment of the actual market value of the various products on which taxes are imposed in this section; said assessments shall be made from the most reliable data available and shall be published in the *Official Gazette* for the information of taxpayers.

DESTRUCTION OF SHIPPING AND DOCK PROPERTY AT HONGKONG

(Concluded from page 151.)

suffering minor damages; *Quinta*, 987 tons; slightly damaged in collision; *Sulberg*, 782 tons, damaged to the extent of $4000 in collision; *Chow Tai*, 1115 tons, badly damaged in collision; under repairs.





Photos by *Mumeya*, Hongkong.

STANDARD OIL COMPANY'S GODOWN AT KENNEDY TOWN; STAR FERRY WHARF, HONGKONG

AMERICAN—*S. P. Hitchcock*, 2086 tons, stranded with hull badly damaged and fore top mast broken, at Kowloon, near Torpedo Depot; still ashore and no salvage commenced; *I. F. Chapman*, 2013 tons, main royal mast carried away; *Hermandia*, 185 tons, badly damaged in collision; *Sorsogon*, 420 tons, foundered alongside the Kowloon Docks; salvage not yet attempted; *Rozario*, old steamer brought from the Philippines to be broken up, stranded at Yaumati Bay.

FRENCH.—*Polynésien*, 3544 tons, slightly damaged in collision; left without repairs. *Fronde*, destroyer, badly ashore near Torpedo Depot; five lives lost; *Francisque*, destroyer, stranded and slightly damaged, near the Victoria Recration Club, Kowloon.

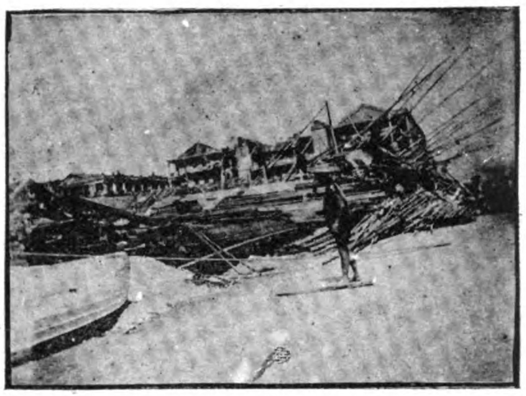
CHINESE.—Revenue schooner, 80 tons, badly ashore in Yaumati Bay; probable total loss; *Kwonglee*, 1468 tons, damaged slightly in collision; left without repairs; *Macau*, 237 tons, broken up in Yaumati Bay.

DUTCH.—*Tjiliwong*, 3062 tons, port side damaged in collision.

JAPANESE.—*Chinkai-maru*, 1564 tons, stranded and almost below water at Kellet's Island; salvage so far unsuccessful; work rendered ineffective by subsequent typhoons; *Sado-maru*, 3860 tons, slightly damaged; *Kanji-maru*, bows damaged in collision at West Point.

NORWEGIAN.—*Fri*, 860 tons, damaged in collision at the south of Stonecutters Island; *Skuld*, 947 tons, driven on the Praya wall at West Point and sustained serious damages.

MISCELLANEOUS.—*Kat On*, 160 tons, stranded in Hunghom Bay; back broken and a total loss; *Chun Kong*, 150 tons, stranded and badly damaged at Hunghom Point; *Castellano*, 178 tons, hulk intended to be broken up, stranded at Yaumati. In addition to this list of shipping many launches were lost. The Hongkong Hotel launch has disappeared completely, but some others can be raised. Ah King has had the salving of the police fleet and has raised launches No. 1 and No. 5, and work is proceeding on No. 2, ashore near Capsimun.



Photos by *Mumeya*, Hongkong.

JEBSEN & CO.'S GODOWN AT KENNEDY TOWN; BUILDING IN COURSE OF CONSTRUCTION OPPOSITE YAUMATI; FERRY LAUNCH WHARF

MANILA RAILWAY COMPANY, LTD.

The following circular has been issued from the London office of the Manila Railway Company, Ltd., to the shareholders and security holders:—

For several years past your directors have been much occupied with negotiations to settle the various claims against the United States of America arising out of the insurrection which followed the American occupation of the Philippine Islands and to rearrange the position of this company *vis-à-vis* the new Government (necessary in consequence of the altered conditions). These protracted negotiations have now been terminated, and an arrangement has been arrived at with the United States whereby, in exchange for certain advantages and a clear definition of the company's position, the Manila Railway Company surrenders its various claims against the United States. The state of uncertainty prevailing ever since the termination of the Spanish sovereignty over the Philippines has thereby come to an end. The terms of the settlement, provisionally agreed, are practically as follows:—

1. All claims against the United States Government or Philippine Commission to be waived.

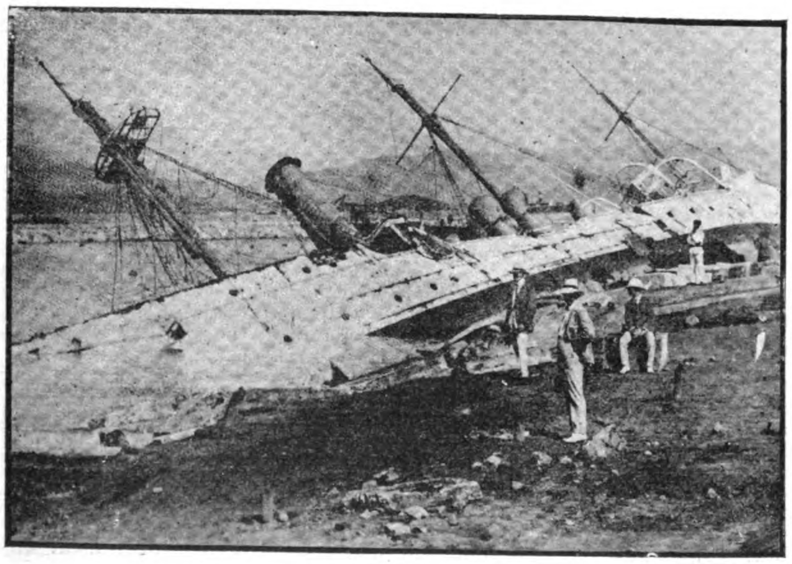
2. All claims against the railway company by the United States Government of Philippine Commission to be waived.

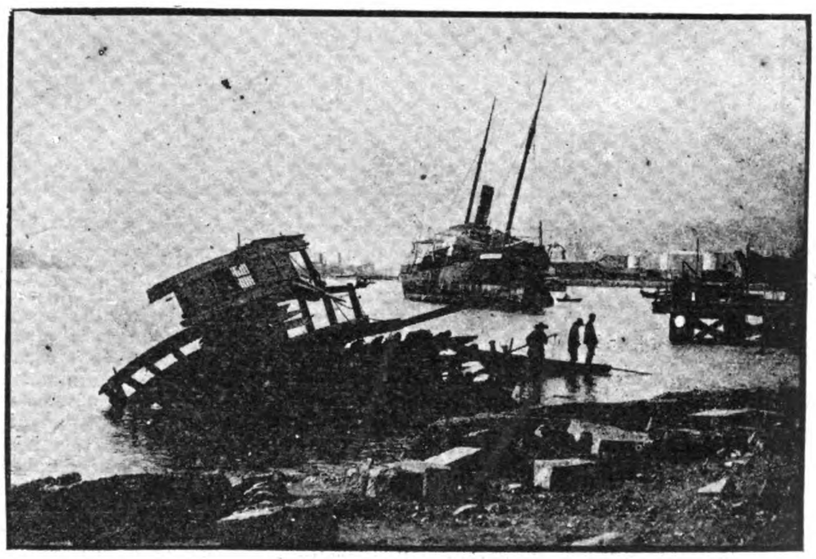
3. Certain reductions in connection with local taxation.

4. The cancellation of the old Spanish Concession, relieving the company of certain onerous conditions.

5. The transfer in some form of the Manila Railway Company to an American Corporation which undertakes to construct about 420 ms. of new railways which should hereafter greatly benefit your present property.

To make this agreement effective the United States Government require the consent of the various classes of stockholders of the Manila Railway Company, and to obtain this, as well as to arrange for the necessary reconstruction of the company, meetings of the shareholders and bondholders will have to be held. It was hoped that this might have been arranged before the holidays, when the position could have been explained and full details given of the various changes necessary; but it was found impossible to arrange the actual settlement of a scheme of reconstruction and make the further arrangements consequent thereon in so short a time. Your directors have therefore decided to postpone until after the holidays the meetings of the shareholders to receive the directors' report and accounts for 1905, and of the shareholders and security-holders for their decision as to the settlement with the United States.





Photos by *Mumeya*, Hongkong.

H. M. S. "PHOENIX" ASHORE AT KOWLOON; LAST OF THE RIVER STEAMER "KINSHAN," BROKEN UP AT YAUMATI; STEAMER "ALABA" ASHORE NEAR BY

RAILWAY CONSTRUCTION IN THE FEDERATED MALAY STATES

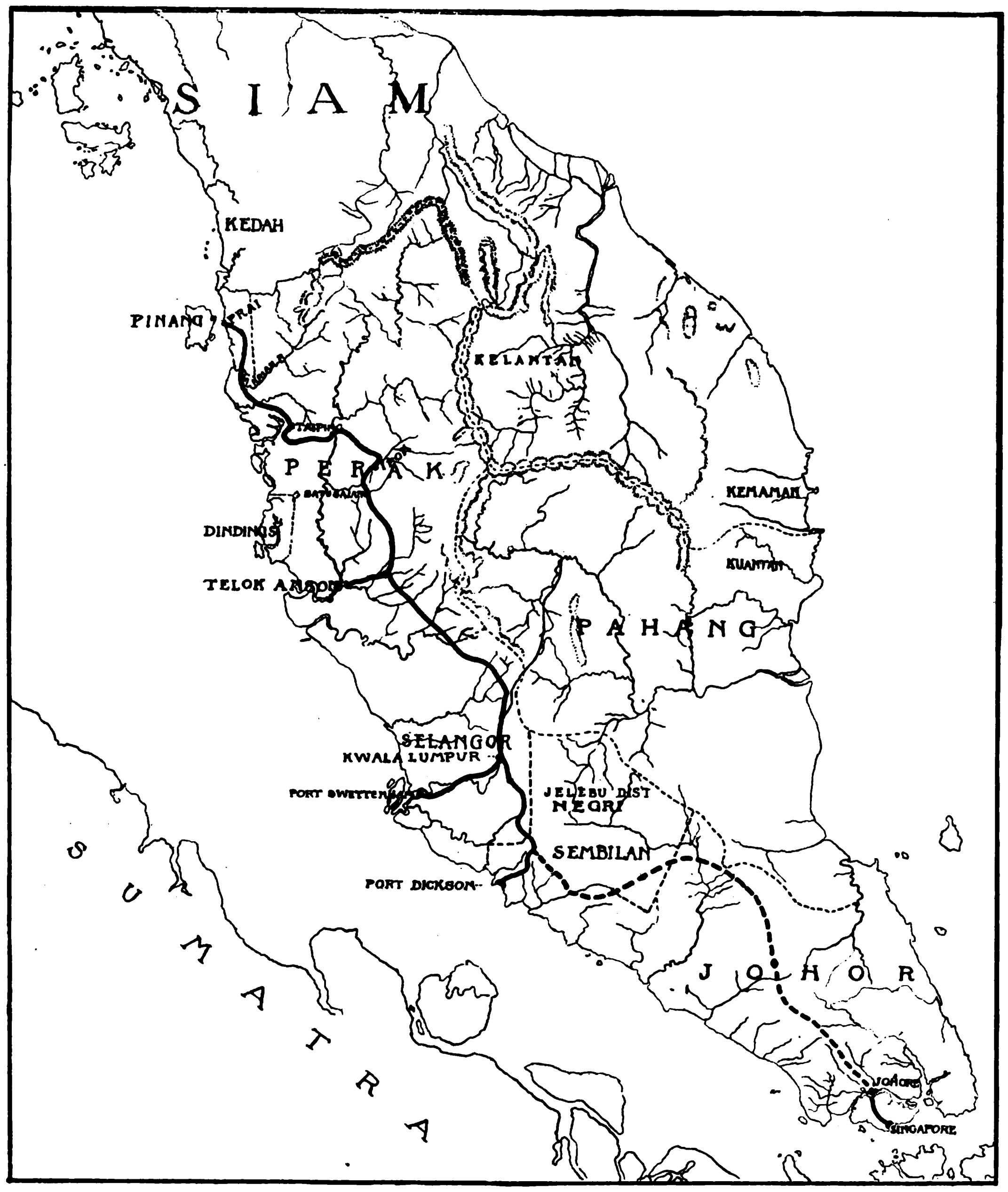
The permanent survey for a light railway from Ipoh to Tronoh, in Perak, Federated Malay States, was begun in September, 1905, and at the close of the year the line had been permanently located up to the 9th mile, leaving about 2 miles more to finish. The expenditure amounted to $2,532 84.

Johore State Railway Survey.—The preliminary and permanent survey of this 120½ miles section was commenced on the 27th of March, 1904, and was completed on the 12th of September, 1905, at a cost of $172.132.83, the expenditure during the year amounting to $83,806.90.

Permanent Surveys for a Light Railway from Tapah via Tapah Town Chendriang and Temoh Railway Station.—Commenced in August, 1905, and by the close of the year 5 miles had been pegged out together with a considerable amount of preliminary work over the whole distance. As it was decided to introduce a motor 'bus service from Tapah Road to Tapah Town, the permanent setting out of the line only proceeded between Temoh Station and Chendriang. The expenditure amounted to $2,458.90.

Gemas to Kuala Semantan.—This preliminary survey was commenced on the 18th of October, 1904, and completed on the 15th of April, 1905, a length of 77 miles. An alternative route between the 10th and 25th miles to avoid heavy works including 3,240 feet of tunnelling was surveyed also, with the result that all tunnelling was avoided; but the length was thereby increased by 2 miles. The survey of this alternative route was completed on the 19th of August, 1905.

The survey branches off the main trunk line at the Gemas Station and runs in a northerly direction to Kuala Semantan in the State of Pahang, where the Semantan River joins the Pahang River. This line, if constructed, will form the first section of what may be termed the East States Trunk Line—that is, a railway starting at Gemas and running through the heart of Pahang into Kelantan and possibly eventually to, say, Bangkok. The cost of this survey was $15,820, of which $14,759.36 was spent during last year and the permanent alignment is now being surveyed and staked out.



FEDERATED MALAY STATES RAILWAYS, CONSTRUCTED AND PROJECTED

Kuala Semantan to Kuala Lipis, direct, Preliminary Survey.—This is a continuation of the East States Trunk Line as far as Kuala Tembeling and should the trunk line follow the route west of Gunong Tahan up the Tenan River, the whole of this section will form part of the main line, otherwise the length between Kuala Tembeling and Kuala Lipis will be a branch line. The survey was begun on the 5th of October, 1905, and completed for 33 miles. The expenditure was $5,921 65.

Kuala Semantan to Kuala Lipis, via Bentong, Preliminary Survey.—This is an alternative route with the endeavor of tapping the mining districts of Bentong and Raub. Work was started on the 9th of September 1905, the starting point being the 49th mile post on the Pahang Trunk Road to Kuala Lipis, and by the close of last year 46 miles has been surveyed out of a total of probably 58 miles. The survey was started from the 49th mile post as it was known that between it and Kuala Lipis or Kelantan a line is practicable. The survey was not completed and the expenditure amounted to $7,136,93.

Kuala Semantan to Kuala Kuantan.—This will form a branch line to the sea coast at the port of Kuantan, about 80 miles in length, 25 miles of which had been surveyed by the close of the year starting from Kuala Kuantan. Work started on the 18th of October, 1905, and the expenditure amounted to $4,849.

Items in the Annual Report.—The following extracts are taken from the General Manager's report for the past year:—

The earliest section of Government railways opened to traffic was in the State of Perak—namely, on June 1st, 1885, from Port Weld to Taiping. The profits on this section for the seven months ending December 31st, 1885, were $15,080.46. The earliest section opened in Selangor was on September 15th, 1886, from Bukit Kuda to Kuala Lumpur, for light traffic only. No working statistics appear to have been kept for this short period, but in 1887 the net profit for this section was $57,703,46. The aggregate amount of net profits earned between the years 1885 and 1905 amounted to $13,491,687.22, or over one-third of the present accounted capital outlay of $37,261,922.

There were eleven fatal accidents during 1905 due to persons being run over on the open line. In eight of these cases the victims were railway employees. In no instance was the railway department in fault, and in each case where an inquest was considered necessary a verdict of "accidental death" was returned. One Chinese coolie was drowned at Port Swettenham owing to his falling between ship and wharf. One Chinese passenger jumped overboard from one of the railway launches between Penang and Prai and was drowned.

The fencing of the main line and branch line to Port Swettenham was almost completed through Selangor and Negri Sembilan and 34 miles 67 chains erected in Perak and the province. Fencing in many places was shifted from wet to dry ground. The experiment made with Madras thorn for railway fencing proved a failure. The plants thrive for a short time and then gradually die out, except in a few places, notably between the central station and Sultan-st. in the town of Kuala Lumpur where the plants have grown into a fairly good hedge. This climate apparentely does not suit it.

Kuala Lipis to Kuala Kelantan.—The route explored follows the Jelai River to Kuala Tenan, up that river crossing the watershed on the Pahang-Kelantan frontier, then down the Galas River to its junction with the Kelantan River and from there passing Kuala Pergau down the left bank of the Kelantan River to its mouth at the port of Kelantan near the town of Kota Bahru. This exploration proved that a railway can be taken into Kelantan by a route west of Gunong Tahan without necessitating any steeper gradient than 1 in 100, though there would be several miles of heavy work and the line would be an expensive one to construct for from 15 to 20 miles out of its total length of 186 miles. A detailed report on this exploration was submitted to Government on September 23d, 1905.

Kuala Tembeling to Kuala Kelantan.—This was undertaken to ascertain if an easier route than the one referred to in the foregoing paragraph existed to the east of Gunong Tahan. It was found that not only would it be practicable to take a railway into Kelantan by this route, but that the distance would be shorter by 38 miles and the country traversed no more difficult than that met with on the Johore State Railway. The distance from Kuala Tembeling to Kuala Kelantan would be about 167 miles and from Gemas about 294 miles. This exploration has proved that a railway can be taken into the heart of Kelantan from Johore Bahru without necessitating any extraordinary expenditure on heavy works and that the gradients and curvature need not exceed 1 to 100 and 30 (say, 30 chains), respectively, over the whole distance of 414 miles. The cost aprproximately would be forty-one million dollars, of which nearly twelve and a half millions is already allocated for the length in Johore. A detailed report on this exploration was forwarded to Government on the 26th February, 1906.

PUBLIC WORKS, STRAITS SETTLEMENTS

The annual report of the Public Works Department of the Straits Settlements, recently submitted to the Legislative Council of the colony, shows that the total expenditure in the department for the period, in each Settlement, was as follows:—

Singapore	$1,066 669.00
Penang (including Province Wellesley and the Dindings)	708,191,72
Malacca	271,802.39
Total	$2,046,663.11

This does not include a sum of $20,583 to meet liabilities incurred in Great Britain for which accounts have not yet been received.

Buildings.—The buildings completed at Singapore include the Central Police Station, the Court of Requests, and thedvaimtnitierAw nse Block, $16,614.08; the currency commissioners' vault, $10,286.71, and two Government residences, Goodwood, $21,021. Considerable progress was made on the new Government Printing Office, the new Tan Tock Seng Hospital, the Beri-Beri Hospital at Pasir Panjang, Raffles Museum extension, and the Victoria Bridge School. The expenditure was $45,663, $74,120, $60,000, $76,147, and $35,150 respectively. A site was purchased on the Trafalgar Estate, Yio Chu Kang-rd, for the new insane asylum for $16,500.

Public roads.—In Singapore good progress was made with the extension of the West Coast-rd, the earth formation (begun in 1904) from Pandan River to Jurong River, a distance of 1.3 ms., being completed, and the earth formation for a further extension of ½ m., from Jurong River to Bukit Damar, begun and completed during the year for an expenditure of $20,347. The total length of roads under maintenance was 89½ ms., of which 81 ms. are metalled with granite and laterite, 4½ ms. gravelled and 4½ ms. natural. The cost per mile was $802, $148, and $138 respectively.

In Penang, the progress made included the extension at Batu Feringgi-rd, a length of 11,-130', at a cost of over $39,000.

Bridges.—As regards bridges at Singapore the report says:—A sum of $100,000 sanctioned in the estimates as a contribution to the municipality for a new bridge over the Singapore River was unexpended, no work being commenced on the new structure. Considerable progress was made with the construction of a new bridge on the West Coast-rd over the Pandan River at an expenditure of $14,462. This bridge is formed of ferro-concrete in three spans of 30' each. The platform is 20' in which supported on ferro-concrete piles. The total number of bridges on the Singapore Government-rds is 56 of which 54 are permanent structures leaving a balance of two timber bridges yet to be converted. These are on the road from the Chang-rd to Tanah Merah Kechil, a natural road. The total number of culverts comprising all of and under 10' is 240. These are all permanent structures and such of them as need repair are being attended to.

Waterworks and Dredging.—The fresh water distilling plant erected at St. John's Island and the service tank for storage accommodation came into operation during the year, the system of distributing mains and services to the various hospital wards and other buildings on the island being completed for an expenditure of $10,755.

The dredger *Mudlark* removed 60,156 tons of silt during the year from the Singapore River. The reclamation along the sea-front of the Singapore Postoffice was completed, a sum of $17,905 being spent during the year. The area of this reclamation is 71,000 sq. ft. and the cost per sq. ft. works out to $3.45, inclusive of the seawall.

Lighthouses.—Owing to the unsatisfactory progress of work in connection with the construction of a new lighthouse at One Fathom Bank and the financial difficulties of the contractor, the contract for the completion of this difficult and isolated work was re-let to Messrs. Riley Hargreaves & Co., who, after extensive preparations in collecting the necessary plant, commenced sinking the piles in December and completed seven before the close of the year, a sum of $33,289 being expended on the work. The sinking of the ferro-concrete piles by means of a double-water jet is now progressing satisfactorily. Three beacons of granite were constructed at Pulan Bukum at a cost of $1,995. All lighthouses were maintained in good order during the year.

General—The depression in trade at Singapore during the year had a corresponding effect upon building operations in the city. The average price of building materials fell about 4 per cent b it the price of labor, both skilled and unskilled, continued to rise, owing to the operations of the Singapore Tramway Company and the extension of the Singapore Railway to the docks and Alexandra-rd.

The officers of the department of all ranks discharged their heavy and responsible duties satisfactorily, working early and late. In 1898, the year in which the present head of the department assumed duties, the total expenditure in the department was $659,166 and the average percentage of European and subordinate supervision 7.86. In 1905 it was $1,942,020 with a percentage of 5.20 for supervision, *i. e.*, the total expenditure in 1905 was about three times what it was in 1898, whereas the percentage of supervision had fallen from 7.86 to 5.20 or 2.66 per cent below the recognized percentage that the cost of supervision should bear to the amount expended. This fact alone bears eloquent testimony to the hard and good work done throughout the year by the officers of the department in the successful and economical execution of works entrusted to their charge.

NEW RAILWAY, BRITISH NORTH BORNEO

British capitalists are planning the construction of a railway in British North Borneo which will connect Marudu and Sandakan bays, and the company will acquire an area of 460,800 acres of land along the route. This land is suitable for tobacco and rubber and includes the valleys drained by the Bengkoka, Paitan, Sugut, and Labuk rivers. With the exception of the Paitan, which has not yet been exploited, all these rivers have been proved to contain good tobacco land, and rubber planted experimentally on the Bengkoka and the Labuk, has met with success.

The principal source of revenue for the railway, however, will undoubtedly accrue from the transport of minerals. The Labuk Valley contains almost unlimited quantities of iron ore of a quality which it is believed should permit of its export without being smelted.

The railway will traverse districts from which large quantities of rattan and other jungle produce are annually exported. From the Labuk alone the export in 1905 was valued at some $83,000. This is exclusive of salt-fish, and sea produce, which will be sea-borne to Sandakan. The collection of produce, and especially of rattan, will largely increase with the improved means of transport provided by the railway.

Timber will provide a very considerable revenue from the commencement. Whatever may be the state of the export market as regards logs, there is always a demand for sawn timber: an additional sawmill located in the timber district along the proposed route will find a ready local market, without in any way clashing with the existing mills in Sandakan and Jesselton, which already are kept constantly busy in coping with orders.

The proposed railway will revolutionize the administration of the most difficult district (as regards transport) in the State; it will cause an immediate increase in revenue from timber and jungle produce, and a permanent indirect revenue from the large number of Chinese who will be engaged in construction, and most of whom will settle in the country after completion of the railway. It will also provide a line for a telegraph which will be more easy to maintain, and less liable to interruption than that between Kaningau and Lamag which it will no doubt supersede. Finally, the natural sequence to the Sandakan-Marudu Bay Railway will be the linking up of the two systems by a connecting line from Jesselton or Tenom to Marudu Bay.—Condensed from *The British North Borneo Herald*

ANNUAL REPORT OF THE STRAITS GOVERNMENT

The report of the legislative council of the Straits Settlements, for the year 1905, has just been published and contains much information of general interest.

The revenue for the year was $11,656,153, the three settlements contributing as follows: —Singapore, $6,629,723; Penang, $2,947,482; Malacca, $2,078,948. There was an increase over the revenue collected in 1904 of $909,635, while that of 1903 was exceeded by $3,697,657. This increase is entirely due to the sale of the Malacca-Palau Sebong Railway to the Federated Malay States, the proceeds of which, amounting to $1,414,218, were placed to the credit of the Malacca revenue. The revenue proper shows a decrease of $504,583 as compared with 1904, and an increase of $2,283,438 more than the revenue of 1903. The principal increases were under the following headings:—Land sales, $1,430,129; reimbursements, $510,668; Post office receipts (including telegraph), $46,024; fees of office, $19,166; district collections, $12,509. The large increase in land sales is due to the sale of the Malacca Railway. Re-imbursements include $470,140.56 transferred from the widows and orphans pension fund to the general revenue of the colony. The chief decreases are under the headings:—Licenses, $954,795; stamps $146,481; interest, $19,374. The expenditure for the year was $11,005,137, an increase of $156,148 over that of 1904, and $2,819,185 more than the figures for 1903. The increased expenditure was incurred in the following items:—Special expenses, $745,-625; lands and houses purchased, $144,248; roads, streets, etc., special services, $55,664; personal emoluments, $45,480; interest, $38,892.

The exchange value of the Straits dollar was maintained at a fairly uniform rate during the first half of the year, the lowest decreased rate being 1s. 11⅛d, in January and April, and the highest 1s. 11⅞d. in May. In July the dollar rose to 2s. 0¼d. and in August to 2s. 1⅛d. and continued to appreciate till December when it reached 2s. 1 1⁄16d. The average exchange for the year was 2s 0 9⁄16d, an advance of 1⅜d. on the average for 1905, and nearly 3¼d on that of 1904. A speculative market and the difficulty of getting cover for banking operations owing to the closing of the mints to the free coinage of dollars were among the causes which accelerated the rise in the value of the Straits dollar, but the main cause was the rise in the price of tin.

The Malacca-Pulau Sebang Railway, which connects Malacca with the railway system of the Federated Malay States, was completed and opened for traffic during the year. In view of the expense of maintaining such a small section with an independent staff, an arrangement was made with the Government of the Federated Malay States, and the Malacca Railway was transferred to the Government of the Federated Malay States on payment of the total cost of construction. It is understood that the returns from traffic on the railway have been satisfactory.

MANCAYAN-SUYOC MINES AND ABRA RIVER PLACERS, LEPANTO-BONTOC PROVINCE, LUZON

(Preliminary Examination by LEONARD LEHLBACH, M. E., Manager Lepanto Mining Company, Inc.)

The Mancayan-Suyoc mineral region is in the extreme southern part of Lepanto-Bontoc Province, in the eastern center of Northern Luzon, the largest of the Philippine Islands. Mancayan is in latitude 16° 53′ N. and has practically the same longitude as Manila.

From Suyoc at the S. to the northern extremity of Mancayan the mineralized area has a length of about 7 ms. and may be said not to exceed 3 ms. in width. It lies wholly on the western slope of the Cordillera Central close to Mount Datá. The Abra river rises in NE. Suyoc flowing S. past the end of the mineral belt, then W. for a short distance, when it takes up its general northerly course, flowing through a basin formed by the Malaya Range on the W. and the Cordillera Central on the E. at about a 4 per cent grade until it reaches a somewhat broader valley at Comillas, about 5 ms. S. of Cervantes, where the gradient drops to 1 per cent. Here have been deposited some 35,000,000 or more cu. yds. of gravels which contain a large part of the gold eroded from the rich Suyoc veins.

The entire topography is made up of steep slopes, V-shaped little valleys cut by the denuding streams. None of the hills are large, none of the valleys deep. Swift flowing mountain streams are on every side, giving in the aggregate not less than 1,000 2d ft. of water in the dry season. All drain into the Abra River.

The climate is an ideal semi tropical one. The rainfall exceeds 120″ *per annum*, 90 per cent of which is precipitated between May and October. There is, however, little doubt that this is rapidly decreasing.

Mancayan at its highest point has an altitude of about 4,000′, the ridge to Suyoc slowly rising, until at its highest it attains an elevation of somewhat over 5,000′, dropping from ridge to valley on both sides some 500 to 1,000′. SE. Suyoc which is directly on the slope of Datá rises from 4,500′ at the Abra River to 7,000′ at the crest of the Cordillera.

I should judge the mean annual temperature of Suyoc to be not far from 60° F., that of Mancayan 65° and Cervantes, probably, 75° F.

The vegetation is not so densely luxuriant as might be expected although both grass and underbrush are sufficiently high and dense to make prospecting difficult. Bamboo is entirely absent.

The mountain sides are sparingly covered with a poor growth of pine and in the higher elevations with scrub oak. The former will answer for rough construction, unimportant mine timbering and charcoal. The hills in the immediate vicinity of the old Spanish workings are absolutely barren, the result of wasteful handling; but sufficient timber is comparatively near to suffice a twenty-ton smelter for many years.

The mineral district and contiguous country is but poorly populated, Lepanto Province having, according to the census of 1903, some 72,750 inhabitants, chiefly Igorots. The white population is a negligible quantity.

The district may be reached by three trails; the latest and shortest of which has a length of about 40 ms., connecting Tagudin at the coast with Cervantes by a 4′ horse trail, having a maximum 6 per cent grade. Most of the supplies have been brought in from Candon *via* Cervantes over a miserable road on pony back at a cost of 2 cts. per lb, the distance approximates 50 ms. to Cervantes over grades almost prohibitive in places. The third route, over the Central mountains to Baguio, is used only by American travelers.

The smelter site at Mancayan is some 26 ms. nearly due E. in an air line from the coast at Tagudin. A good automobile road, having a length of about 35 ms. can be constructed at a cost of less than $175,000, United States currency, which with some additional expenditure may be converted into a railroad grade for freight traffic, when necessity demands it.

January 1900 saw the advent of the first party of Americans into this region, soon followed by others. Many of these men were western prospectors discharged from our volunteer army. Others had never seen a mine before. It took but a short time for these adventurous spirits to stake the countryside for miles around. They organized a mining district, adopting *in toto* the American mining laws. They formed themselves into parties, their "bad men" as usual ordering some of the weaker ones to pull up their stakes and get out. It is surprising that there was no bloodshed. Time passed, things became calmer, provisions and money gave out. You can not develop and operate a copper mine 7,000 ms. from a smelter without considerable capital. Many of the old faces, including mostly the "bad men," disappeared. A few new ones came in. The act of congress, relative to the location of mining claims, approved July 1st, 1902, was promulgated and once more the Americans staked out their claims. The entire surface of the country is covered, excepting in the stream beds, with a heavy trachyte flow that made poor man's prospecting out of the question. I have stated that there was no money. Some of the Americans turned their attention to neighboring Suyoc with its rich gold veins. Two fortunate fellows found a pocket worth $3000. Many eked out a miserable existence living on the native sweet potato. Others living by doing the assessment work for absentee claimholders. The conditions today are unchanged. About 60 claims are held in the district by these men with a full and sublime confidence that sooner or later capital must come their way. In all these years they have made no single serious attempt nor have they gone one jot out of their way to look for it.

Suyoc has always been a gold rather than a copper camp. Today the desultory labor of a few Igorots produces more than 1500 ozs. *per annum*.

These poverty-stricken prospectors have been for 6 yrs. living within a few miles of 35,000,000 cu. yds. of pay gravel, much of which (the shallower reconcentrated areas) is rich enough to have enabled a white man aided by the cheap Igorot labor to make good money. Few of these men but have passed through the 4 ms. of these placers a score of times. All of them must have known that the gold eroded from the rich Suyoc veins had no other outlet than the Abra River and that, until it reached the broad flat valley of Comillas, was too steep to precipitate the gold it carried. Several of the men have since told me that they often thought of prospecting the benches, but they never did. It remained for a stranger to the district, to, with his friends, take it up. The following dry season will probably see it thoroughly prospected. The writer having spent a month in surveying and examining these placers believes that they will be found of very considerable value.

GEOLOGY.—A comprehensive geological study of the Lepanto mineral district would of necessity require the reconnoissance of a region containing quite 1500 sq. ms. A territory at present almost entirely unsurveyed. So lenghty a field study as this comes not well within the province of a mining engineer's duties but is properly for the trained government geologist.

Few explorers have visited this region in the past. Hernandez in 1855 spent 17 days in the mountains and on his return first excited public interest in Mancayan. He, however, attempted no more than an examination of the one ore occurrence which was then a mere prospect.

Santos who from 1864 to 1875 so abld managed the Mancayan copper mines paiy little or no attention to the geology a mile away. The able von Drasche passed through the country in 1875 on a rapid reconnoissance of a very large area. He had no maps and could do little more than make a superficial examination. Mr. Becker of the U. S. Geological Survey made a trip around the islands of the Archipelago in a gunboat, it being hardly safe at that time to travel any other way. He could not as he explains it go further inland than the boat's guns could shoot. He picked up on the coast and rivers pebbles and boulders. They told him quite a story. Returning to America he compiled what all the other writers had to say with what he gathered in his trip and made many excellent deductions therefrom, which are published in the 21st Annual Report of the U. S. G. S.

In the winter of 1903-4 Mr. A. J. Eveland, Geologist of the Philippine Mining Bureau, made the first systematic study of the district but, naturally, only a preliminary report was justified. His report appears as Bulletin No. 4 of the Mining Bureau as "A Preliminary Reconnoissance of the Mancayan-Suyoc Mineral Region."

My three months of field work were not intended as a geological study in more than the preliminary examination of the Mancayan copper mines, the Suyoc gold and copper prospects and the Abra River placers necessitated the securing at first hand sufficient reliable data to enable me to venture with some measure of safety a theory of the genesis of the ores, their probable extent and continuity.

I lacked a topographic map and did not make a complete survey of the district as I expected to receive in ample time the new map prepared by the Mining Bureau; unfortunately, however, lack of lithographic facilities in Manila has delayed its appearance. I drew a rough map on which, aided by the miners, were drawn all the claims located, the roads, trails, rivers and prominent objects. This took a day or so and, rough as it was, sufficed for my needs. A hasty compass survey of SE. Suyoc, a compilation from a Spanish map of Mancayan, a plan of the under ground workings at Mancayan, kindly sent me by the Mining Bureau, and a transit and stadia survey I made of the Abra River placers left me little to want for.

The known mineral areas of economic importance in Northern Luzon may be said not to exceed 3 ms. in width, they are usually much longer, all lie on the western slope of the Cordillera Central. Commencing with the southern most Benguet field a line bearing N. 23° E. would closely bisect all of them. Between them stretch long areas of apparently barren regions. There is sufficient similarity in all the ore occurrences of Lepanto and Benguet provinces, most of which I have visited, to warrant the assumption that in all probability the same common causes that created deposits in one place caused deposits in all.

Diorite is the underlying rock in Lepanto as in Benguet. Several igneous intrusions have taken place. A wide granite intrusion some 12 ms., possibly much more, in length marks clearly the western limit of ore deposition for both Mancayan and Suyoc. East of this hornblende-granite intrusion in the basal diorite are several occurrences of the outcropping of rhyolite or quartz-porphyry intrusions, either one fairly large mass or three separate dikes. I incline to the belief that further development will prove them to be three vents to the one intrusion. The general strike of all the igneous intrusions is N. 20° W., the dip E. and varying from 10° to almost vertical and with many indications of steepening at depth. In SE. Suyoc the Copper Queen Creek has cut its way through a mass of dioritic conglomerate of great thickness, this is undoubtedly the same rock von Drasche describes as the

"Agno Beds" as "consisting in the lower portions of coarse breccias and conglomerates of dioritic rocks, very coarsely bedded, with pebbles often of enormous size." I quote from Mr. Eveland:—"Regarding ages of these rocks nothing can be said excepting the deductions already made by others......von Drasche first classed them as primitive, then Paleozoic. Later Abella seems to have obtained fossils in the upper strata, of shells of surviving sepecies, and lignite, and adopts the hypothesis that these 'Agno Beds' represent the basal conglomerate formed during the Miocene subsidence of the Philippine Group." These descriptions leave little for me to add under this heading, but as they are the source of ore deposits of considerable magnitude not hitherto written about I shall speak of them at some length under the proper caption.

In the extreme southern end of Suyoc but on the western slope of the Cordillera is an occurrence of basalt which also is the depository of rich, although possibly not large, ore bodies. Overlying the conglomerate north of the Copper Queen Creek I find a 12' seam of clay underlying a thin sheet of trachyte.

The entire togography is covered with a trachyte flow. Von Drasche calls it sanadine-hornblende-quartz-trachyte, Mr. Eveland is more modest, or has a greater idea of the economy of space, and simply says trachyte. The shorter name will suffice. Mr. Eveland further speaks of it as being a rock of the utmost importance as having a direct bearing on the ore deposition of Mancayan. I can not in this agree with him. I will go into the matter more fully under "Genesis of the Ore." The trachyte as studied all over the district seems to be a flow of very recent date from the E., most likely from Mt. Datá which I see no reason to doubt was not very long ago an active volcano although I agree with Mr. Eveland in that it very likely is "the residual mass left by erosion of the eastern limb of the broken anticlinal arch, and added to by latter volcanic action." The entire district I have stated elsewhere is cut by many swift flowing streams, all of which have cut their beds in the rocks underlying the trachyte. Southern Suyoc shows me clearly that at the time of the trachyte flow there existed a topography not much different from the present, and in that district the general contour of the trachyte-conglomerate contact follows very closely that of the usual water line. The trachyte is thickest at the mountain crests and shades to nothing in the valleys. The rock itself can only be called a rock by the technical courtesy that classes water a rock because it is made up of mineral molecules. It is a much decomposed gritty crumbling mass, sometimes almost earthy, at other times ashy in appearance with large phenocrysts that aggregate more than the ground mass, in no instance that I have so far been able to find does it have a depth of 200'

Hot springs in great number are met with in Benguet S. of these ore deposits and near Cervantes, N. of them. These springs contain chlorine, sodium, and other solvents.

Briefly, then, a glance at the attached sections will give the general geology. A is a section through the ore deposits of Mancayan bearing, N. 45° E., it shows an underlying diorite intruded by granite and quartz-porphyry intrusions, the latter for some 200' of width containing lenticular masses of tetrahedrite, enargite and other locally less important minerals. Covering all excepting at the granite and porphyry outcrops and the river bottoms is a mass of trachyte. B. is a section through the Palidan and Gatugat Slides, old Igorot workings in which there is among the natives considerable activity today. This bears S. 72° E. cutting through the Rogers, Igorot, Montana, Gatugat and Laura claims. Again we have the underlying diorite, the granite intrusion, here, is a considerable distance west of the commencement of the section, also the same quartz-porphyry intrusions and the same trachyte capping. The ore occurrences are however much different as will be spoken of later. C is a section through southern-most Suyoc bearing S. 45° E. Here also underlying diorite, the granite again too far W. to have place on the section, the trachyte capping, the quartz porphyry intrusions but no ore deposition shown until the eastern bank of the Abra River is reached when in diorite are several small veins of rich gold, lead and zinc content and last of all in the coarse conglomerate which here by the grinding action of faulting has been brecciated exceedingly fine, the lines of the minor faults filled by replacement with quartz veins.

The Abra River placers are dry benches formed by the eroding and corrading action of the heavy precipitation in the Suyoc region, the corraded matter being carried down by the numerous small streams to the Abra River which entirely encircling Suyoc is the only drainage the district has. At the time of the formation of these placers the annual precipitation was likely twice the present 120 to 150", the gradient of the Abra River from and through Suyoc to the Comillas Valley is closely 4 per cent, too great to permit of the precipitation of the metal carried in suspension. Over the 4 ms. the placers extend the gradient has dropped to slightly less than 1 per cent. The river has made its way through an overlying trachyte quickly down to the underlying granite, basalt diorite, carrying with it in times of flood many large boulders, approximately 5 per cent of the volume of gravel is in pebbles of from 9" to 3' in diameter. These have acted as riffles, allowing but little gold to escape below the flat. A survey of the benches shows three main channels that at different periods have been the river's beds. It would seem that firstly the bed was from 2,000 to 4,000' W. of its present one, this became filled up with gravel to a depth, shown by exposures of, in places, 50', then a new channel was cut lower down to the E. into which, besides the gravels carried down from Suyoc, were reconcentrated a part of the gravels from the older bench, the same thing has happened three times. Two cross-cutting streams, as may be seen by reference to the accompanying map of the placers, have reconcentrated still further, large areas. I speak of these placers under a separate head at greater length.

GENESIS OF THE ORE.—It is somewhat early to venture an authoritative statement anent the genesis of the Mancayan Suyoc ores. I propose to give the facts and hazard the theory I deduce from them. It will be some years hence, after diamond drills, shafts and tunnels have penetrated far into the bowels of Mother Earth, before the genesis of these ores can be authoritatively given.

Some 30 odd ms. S. of and 10 ms. N. of this region are noticeable many hot springs, bubbling forth from unknown depths, their heated waters charged with chlorine, sodium and other minerals.

The basal diorite of Lepanto, as of Benguet, has been intruded by long narrow dykes of igneous matter, prominent among which is a strong occurrence of rhyolitic quartz porphyry. The entire region has been the center of many and repeated shattering shakes. In places, generally parallel to four directions from N. 8° E. to E. These slips have resulted in the formation of brecciated zones of considerable length and breadth, finest always, of course, in the central parts.

The Mancayan deposits consist, so far as present development shows, of lenticular masses of enargite and tetrahedrite, there being frequently associated with the latter chalcopyrite, these minerals are contained in a calcareous quartz gangue which frequently does not comprise ten per cent of the mass. Here and there throughout the mine covellite, and more sparingly, some other of the copper minerals are observable. Outside the lines of the ore shoot the quartz porphyry dike is found in places to be of medium grade copper value containing gray copper ores as small islands in parts of its mass and as the lining or filling of small seams The lenses vary in size, from one several hundred feet in length by 20' in width and an unknown depth to others, little fellows, not much larger than cracks. All occur within the quartz porphyry intrusion and within the confining walls of a chimney or shoot some 200' wide by an indefinite depth, striking in a general SE. direction at a low dip from the horizontal. These lenses are invariably parallel to the well defined lines of the numerous minor fault seams. Their quartz gangue plainly shows its origin to have been through the replacement of another mineral. I believe that closer examination will show the entire set of lenses to be connected one to another by thin seams or crevices of material similar to that they contain and that through these channels the heated rising waters have penetrated carrying from greater depth silicious solutions well charged with the elements that form the copper minerals. These waters travelled upwards until they reached a zone where the pressure that forced them no longer was so strongly felt when the deposition of their minerals and the replacement and enlargement of the cracks commenced.

Let us return now to the time of the quartz porphyry intrusion. An acidic mass from 500 to 1500' in thickness and more than 35,000' in length was forced upward through the diorite in a line parallel to the earlier granite intrusion and east of it. A plastic, almost fluid mass, such as this must have been, follows the line of least resistance in coming to the surface, here this was a weakened or shattered zone, a long narrow area of crushed rock, caused by the granite intrusion. It rose to the surface. In different parts of its length it cooled at varying temperatures and, possibly, was affected by other conditions, evidenced by the different textures of the rock, the great differences in crystallization and phenocrysts and the lack of them. In cooling it contracted, causing fissures and cracks which soon became the ready channels for the escaping vapors, gases and waters driven off by the heated mass from its lower and more slowly cooling regions. These vapors, gases and waters were probably fumeroles that died out soonest at the highest elevations. They live today as the hot springs of the N. and S. at elevations of from 500 to 2500'. This intrusion caused fissures and cracks to its east as did the granite intrusion before it. These in Suyoc have been filled, or possibly by replacement of their walls enlarged, into several veins, one several thousand feet long and of strong width, others much smaller, and while not absolutely parallel to the dikes never forming more than a small acute angle with them. The repeated shaking and shattering and minor faulting caused more fissuring, much fracturing, and considerable brecciation. All favorable to and used by the percolating waters in effecting their task of ore deposition.

It should be remembered that nearly the entire topography of the district is covered by a thin trachyte capping which completely hides from us the secrets of Nature's store house, other than is shown us where the swift flowing streams have hewn their beds through, into the more solid rocks, exposing an occasional ore deposit. There is therefore no reason to doubt that further exploration beneath this cap will result in the discovery of other ore deposits or rather other parts of this great one. That we know here now is but the index finger that has been so kindly pointed for us.

In SE. Suyoc the Conglomerate beds were faulted by three or more minor slips or faults, having a general NE-SW direction, resulting in fine brecciation of the diorite pebbles. Here causes, similar to those at work in Suyoc, caused but slightly different results. The brecciation was of sufficient length to have permitted the formation of veins instead of lenses.

CHARACTER OF THE ORE.—The Mancayan ores are gray copper ores, principally enargite and tetrahedrite, the latter frequently associated, with chalcopyrite and in the lowest level of the mine overlying a large deposit of enargite I found a considerable quantity of covellite embedded in enargite. In much lesser quantity are to be found tenantite and

malachite. As stated under genesis these ores are contained in a calcareous quartz gangue. The mine also contains large quantities of pyritous ores worth some $5 in gold per ton, contained in a similar gangue. Associated with the enargite is a small percentage of zinc. All the minerals seem to carry small gold and silver values, but I have not so far ascertained the exact relationship.

Suyoc in the main dike contains exactly similar ores to Mancayan but, owing to the more limited development of the district, the quantities in sight are much smaller and probably development will prove the lenses to be smaller than in Mancayan.

West of the main dike occur small veins of a calcareous quartz carrying sphalerite, galenite, bornonite, gray copper and free gold.

East of the main dike are strong occurrences of a calcareous quartz vein carrying pyrite and free gold with a hanger rich in copper sulphides. Here also are many occurrences of weak veins carrying galenite, sphalerite, many of the copper sulphides, pyrite, marcasite, and free gold. The Palidan and Cayan Slides which contain large quantities of debris from the old Igorot workings and from erosion, contain, as also some other parts of the district, small occurrences of gypsum which is of no economic importance and probably owes its origin to the action of sulphuric acid from the decomposing sulphides on the calcareous matter of the gangue.

The strong quartz replacement vein of SE. Suyoc which is in the brecciated dioritic conglomerate consists of a quartz gangue heavy in calcite. The principal minerals are chalcopyrite, tetrahedrite, several undetermined silver minerals, pyrite and gold. In addition, but of small economic importance, are many of the copper minerals including chacocite and some tenorite. Every assay of ore in this vein so far has carried in excess of 8 per cent cu., 12 oz. ag. and 0.10 oz. au. per ton.

Earlier in this chapter I ventured the hypothesis that ascending waters had deposited their mineral freight close to the surface. I by no means am to be misunderstood as saying that the deposits are superficial ones but that in my opinion it will be found that at depth values will become less until at something like 2000′ it is probable pay values will cease. *Should, however, these deposits continue to 1000′ at 50 per cent of their present value this will be one of the world's richest copper camps.* I believe that the secondary sulphide enrichment of Mancayan is simply the result of a continuation of the process of ore deposition until having deposited in an original form as chalcopyrite the ores were worked over again until the present very rich sulphides resulted, not necessarily at the expense of the levels immediately below but possibly carried up from the same depths that sent up the first mineral. It is, however, also possible that this concentration has been effected through either robbing the ores immediately below or from minerals contained in eroded thousands of feet above. There is now an annual precipitation of over 120″ falling on very steep slopes which may mean that descending waters have caused the zone of secondary enrichment.

OCCURRENCE OF THE ORE.—Present development shows rich ore deposits of probable magnitude at the Lepanto and Bontoc claims, the old Spanish copper mines, in Mancayan, the Cayan, Palidan, Gatugat and Quien Sabe workings of Central Suyoc and the Copper Queen Creek and Gobossen workings of SE. Suyoc.

The center of Mancayan from a mining standpoint, is the large ore body of the Lepanto and Bontoc claims. This is partially developed by some 6000′ or more of underground workings, galleries, winzes and stopes, which prove the existence of the strong shoot described in the last chapter. Mr. Eveland states in his report on the district:—"One important observation is worth recording: The lowest tunnel, a regular and large gallery, driven for drainage, has in its present length, and in the side drifts, which are under the greater part of the other workings, no sign of ore—in decided contrast to the rich values of a few feet above; the explanation of this is not certain." This does not agree with the facts as I have found them. Unfortunately this part of the mine at the time of Mr. Eveland's visit was in such a condition as to preclude the possibility of a thorough examination. The side galleries draining the richer parts of the mine were filled with a solid gossan to within a foot of their top. The richest parts of the mine are several hundred feet, E. of this drainage tunnel and no attempt was ever made by the Spaniards to use it for other than drainage purposes. A closer study of the deposit shows that while the ore occurs within the quartz porphyry dike, it is unlikely it would, as gray copper ore, assaying 16 per cent cu., occur throughout every part of a mass 1000′ in width. It may in fact be seen that ore occurs here only within the walls of a chimney approximating 200′ in width, dipping some 10° from the horizontal downward in a southeasterly direction, showing evidences of greater strength towards the S. Furthermore I have found several occurrences of small seams of rich enargite within the drainage tunnel; and its walls over a considerable part of their length carry or are a low grade copper ore. The side galleries leading from it were Sr. Santos' drainage system for the mine and nolateral drifts have been run from them in search of ore. From their location I should unhesitatingly declare them to lie W. of the probable ore zone, not under it. I may also say that my richest samples have been taken from the lowest levels of the mine where large bodies of high grade ore exist.

The result of 36 yrs. of Spanish operations with a crude Mexican smelter is the accumulation of dumps containing approximately 100,000 tons of ore worth about $20 gold per ton, with possibly as much more, the result of the same and previous native operations, spread out along the Mancayan River in the Copper Placer claim.

On the Tombstone and Orient claims immediately NW of the Bontoc claim are several exposures of low grade copper ore. It is improbable that the rich ore shoot above mentioned will extend so far N. as its full strength seems to come from the S. Still further N., about a mile or so a prospecting tunnel has cut into low grade copper ore. No attempt has been made since its discovery, several years ago, to prospect it further, and, while it may possibly in years to come be found to contain a body of ore, for the purpose of estimating future possibilities we may forget it.

The Keystone claim lies SE. of and immediately adjoining the Lepanto claim and as I have previously stated the full strength of the ore shoot goes towards it and prospecting tunnels have located ore there. Whether this ore shoot goes beyond the southern boundary of the Keystone claim or not is problematical. Dipping as it does at 10° or somewhat more a diamond drill hole would find it on the adjoining claim, the Manila American, at a depth of about 800′, allowing for the difference in elevation of the surface.

Beyond this I doubt there will ever be found an economic occurrence of copper ore until Tuboc is reached. Here I have not been favorably impressed, but the claim holders are energetically pushing development and report to me having cut through the trachyte by their tunnels into the quartz porphyry dike and that they have found ore. Unfortunately the tunnel in which this happened was allowed to cave before I could examine it, and at the time of writing has not been taken up.

At Cayan we reach a different class of ore occurrences, those characteristic of Suyoc. Here undoubtedly are many occurrences in leads, more or less strong, of copper and pyritous ores in silicious and gypsum gangues. The latter certainly superficial deposits, the former more likely leaders from or to a larger deposit not yet opened up.

Palidan presents an ore deposit of considerable magnitude, opened up by Igorot gopher holes and erosion over some 1200′ in length. It is in appearance a slide, some 1200′ or more across the top, maintaining a fairly uniform width to the bottom some thousand feet or so lower, on about a 45° slope, pierced here and there with numerous small galleries. In the dry season viewed, at a distance of a few miles it glistens in the sunlight with all the beautiful colors of peacock ore. Close at hand it is found to be an enormous dump and talus heap, containing undoubtedly much low grade copper throughout and causing the miner immediately to speculate as to whether concentration could not be made to give up its possible value. A closer inspection of the little gopher holes shows that they have been run in following rich leads of tetrahedrite, bornonite, and in one instance a well defined strong lead, close to the western terminus of the slide, of galena. All have been found in lenticular pockets, to be rich in free gold. This should be the scene of determined development work. There is no doubt that a large ore body exists, but in its present state of development and ownership nothing can be done with it. These conditions will undoubtedly better in time and it may then become a rich center of Suyoc. Gatugat, 1000′ away, is the same thing on a smaller scale, but fortunately without the troubles of complicated ownership. At the foot of the Gatugat workings for several thousand feet stretches the Quien Sabe vein, which on the Quien Sabe claim, of Mr. Albert P. Wright, has in past years been the scene of great activity and production in free gold. The vein is a strong one, the strongest of the district. Its main body, a whitish calcareous quartz, carries gold and some pyrite, the brecciated hanger, good copper values. It is to be hoped that no time will be lost in developing this and the adjoining claims as they offer considerable future promise. On the Laura claim of Mr. C. A. Pettit, somewhat close to the northern end of this vein and in the quartz porphyry dike, in lenses, I have taken some rich samples of copper ores: lack of development prevents my saying more than that it looks good.

Between this and Copper Queen Creek are several occurrences of small veins in the diorite country. These carry copper, lead, and zinc sulphides of an appearance to indicate origin through surface waters, also free gold.

In Southern Suyoc, Copper Queen Creek has cut its course through the conglomerate beds described elsewhere, exposing one strong quartz vein some 4 to 6′ wide. This is called, locally, the Copper Queen vein, and in the Anaconda and Elizabeth claims, one on either bank of the creek, has by tunnels into the mountain along the vein been proven over some 800′ of length. It is probable that the ore shoot continues beyond in both directions but it can not be estimated how far. In the breast of all four tunnels it seems as strong as in the center. Over all its length samples have been taken showing it to be rich in copper, silver and gold. Some few hundred feet further up the creek are similar exposures of rich ore but in weaker veins.

The general strike of these occurrences is NE.-SW. and some 2,000′ SW. in the direct line of strike are the old Gobossen workings comprised now in the Gobossen claim. From these, in the past, considerable gold has been taken. Like the Palidan and Gatugat workings it will here be necessary to do considerable prospecting and development before an idea may be formed of the probable value of the deposits.

The entire district may be said to be in its infancy, while it has been known that minerals exist here, for many years, and while for 5 yrs. American prospectors have been at work, there has never been excited the interest of capitalists, very likely for no other reason than that the field has never been properly or at the proper time placed before them. There is every reason to believe that future development work will succeed in opening up, not only the deposits I have described, but others, at present hidden by the trachyte capping and not now dreamed of. Also the outlying portions of the district, especially to the east, will be prospected and certainly offer encouragement. It must however always be strongly borne in mind that this is not a poor man's district and that either prospecting or development without strong financial backing is but financial suicide.

(To be continued.)

HON. W. MORGAN SHUSTER,

Member of the United States Philippine Commission and Secretary of Public Instruction

YANGTSZE RIVER STEAMER "LOONG-WO"

There was recently completed at the yards of the Hongkong and Whampoa Dock Company, Ltd., Hongkong, the magnificent steel twin-screw river steamer *Loong-Wo*, of 3,9?3 tons gross and 2,386 tons net register, built to the order of the Indo-China Steam Navigation Company, Ltd., Messrs. Jardine, Matheson & Co., general managers. She is a sister ship of the same owner's steamer *Tuck-Wo*, turned out at the works of the London and Glasgow Engineering and Iron Shipbuilding Company, Ltd., Govan, Glasgow.

The *Loong-Wo* is now plying in the Yangtsze River passenger and cargo trade. She is the largest vessel so far constructed in China, and is unrivalled in point of sumptuous and luxurious furnishings. Taking into consideration that all material had to be imported, it reflects great credit on the officials of the Hongkong and Whampoa Dock Company, Ltd., to have built and engined a vessel of her size and class well within the contract time of 11 mos., which compares most favorably with builders in Great Britain. The excellent workmanship and material that the dock company is in the habit of turning out is well known throughout the Far East, and is evidenced in the construction of the steamers *Kinshan, Kinling*, the U. S. S. *Fathomer*, and numerous other craft, as well as in the large repairs of all kinds the company is constantly effecting in vessels of every description, from leviathan battleships to steam launches.

The principal dimensions of the *Loong-Wo* are as follows:—

Length between perpendiculars.....	330′
Length over all..............................	342′
Breadth, moulded at main deck	46′
Breadth over guards.........................	58′
Depth, moulded to main deck at side..	15′ 6″
Height, main to upper deck..............	9′
Height, upper to promenade deck.......	7′ 3″

The hull, which is of Siemens-Martin mild steel to Lloyd's test, has a dead-weight carrying capacity of 1,800 tons on 12′ mean draft in fresh water, and when so loaded is capable of maintaining an average speed 13 ½ knots.

There are three decks—main, upper and promenade. The accommodations for Chinese passengers is on the upper deck and that for whites on the promenade deck. The smoking room is situated on the promenade deck aft.

The machinery consists of twin-screw, tri-compound, direct-acting engines on the Yarrow-Schlick-Tweedy system—triple-expansion surface-condensing—each set having four inverted, direct-acting steam cylinders, bolted together side by side and working on 4-throw crank shaft. The high-pressure and mean-pressure cylinders are placed between the two low-pressure cylinders. The diameters of the engines are 17″, 28″, 31½″ (2) by 33″ stroke. Their working pressure is 180 lbs. per sq. in.

There are two boilers of Siemens-Martin mild steel, 15′6″ mean diameter by 11′6″ long, designed and constructed for a working pressure of 180 lbs. per sq. in., in accordance with Board of Trade requirements. Their heating surface is about 5,400 sq. ft., and grate area 135′. Each boiler is fitted with four Brown's furnaces. There is also one donkey boiler, 8′ diameter by 8′ long by 85 lbs. pressure. Howden's system of forced draught is also a feature.

The vessel is lighted throughout by electricity, the installation consisting of two 15-kw. 100-volt sets, by Messrs. Clarke, Chapman & Co. Electric fans are fitted in all staterooms for both whites and Chinese, the saloons and smoking rooms; also a complete set of electric bells.

A feature of the steamer is the almost entire absence of vibration when under steam.

"INTERESTING MANILA"

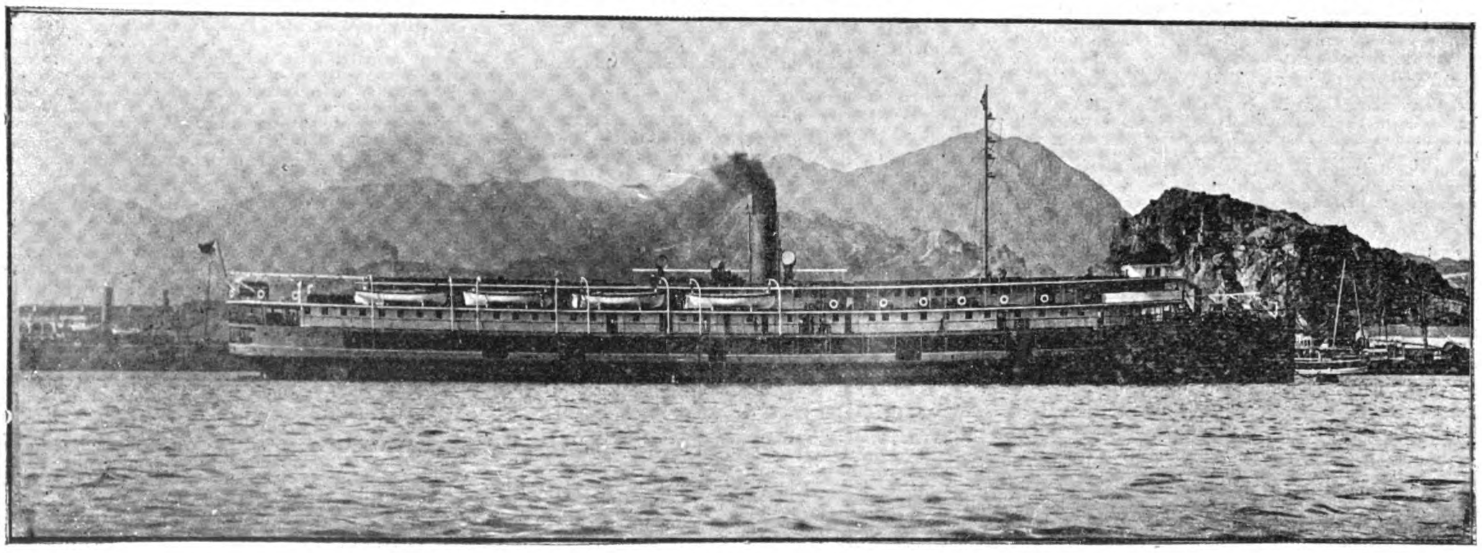
[*Interesting Manila* (second edition), by GEORGE A. MILLER, author of *Ruins and Romance of Guadalupe* and *Things Worth Seeing in Manila*. Press of E. C. McCullough & Co., Inc., Manila.]

In his preface to the publication, the author says:—"This second edition of *Interesting Manila* is issued in response to a demand which exhausted the first edition within three months. Much new material is added to the old, and the illustrations are nearly all new and many of them appear on these pages for the first time. These sketches are offered as a faithful and unprejudiced account of customs, habits and objects of interest peculiar to a life rich in that oriental flavor so fascinating to the pilgrim from the great West. Of the multitude that has come to these shores, few have suspected the existence of the treasures hidden behind the old walls, and many a dreary day might have been brightened by visiting some of these most interesting historical spots. This volume may serve a double purpose. As a key to Manila it may unlock many doors of walls that hide things worth seeing. As a souvenir of the city and description of its life, it may supply detailed and accurate information for friends at home. The writing of many letters is a weariness to the flesh, and as flights of imagination have been eliminated from these pages, the data here assembled may be taken as authentic."

Interesting Manila is profusely illustrated with halftone cuts and sketches in black and white. The book is very neatly bound, is printed on fine super book paper, in clear bold type, and altogether it should be a credit and a valuable addition to any library. For sale by E. C. McCullough & Co., Inc., and all book dealers in Manila. Price $1.50 gold per copy.

"PURIFINE"

Messrs. Denniston & Stanfield, Room 15, Paris Building, 34 Escolta, Manila, have been appointed sole agents in the Philippine Islands for "Purifine," an odorless and non-poisonous disinfectant, which gives promise of becoming very popular with sanitary engineers and others in the territory their representation covers. In addition to its most appreciable qualities already mentioned, "Purifine" will not burn nor stain. It does not change in effectiveness by exposure and it has no sediment to choke waste pipes, while it may be diluted for personal use in any kind of water, even salt water, to any weakness desired. "Purifine" is highly recommended by the health departments of many leading cities, as well as the management of numerous large and private hospitals. In view of its high reputation, sanitary engineers and the health departments of the cities of the Orient can not help but look upon it with favor.



YANGTSZE RIVER STEAMER *LOONG-WO*, BUILT BY THE HONGKONG AND WHAMPOA DOCK COMPANY, LTD.

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

RAILWAYS AND RAILWAY SUPPLIES

MANILA RAILWAY COMPANY, LTD.—The London offices of this company have been removed to No. 7 Union Court, Old Broad-st, E. C.

MUKDEN-SINMINTUN RAILWAY.—This line has been opened to traffic. The distance between the termini is 36 ms., time to cover it 3 hrs. 20 mins.

KORSAKOFF-VLADIMIROVKA RAILWAY, SAGHALIEN.—This railway, which is in the Japanese portion of the Island of Saghalien, is about completed.

CANTON-HANKOW RAILWAY.—Taotai Kwang Sing Chi is the new manager of works for this line, and has entered upon his duties with headquarters at Canton.

TATSUNO-CHO-ABOSHI HARBOR LINE, JAPAN.—The construction of this line in the Prefecture of Hyogo, covering about 6 ms., has been sanctioned by the Tokyo Government.

SEOUL-FUSAN RAILWAY, KOREA.—The Japanese military authorities have formally handed over at Chemulpo the Seoul-Fusan Railway to the director of the Korean Railways Bureau.

RESTORATION OF THE TIENTSIN RAILWAY.—Negotiations for the restoration of the Tientsin Railway to China have been opened by the Chinese officials with the foreign ministers at Peking.

FEDERATED MALAY STATES RAILWAY SHOPS.—The railway shops of the Government of the Federated Malay States, which were recently removed from Taiping to Ipoh, are to make another journey, and this time to Kuala Lumpur, the federal capital.

CANTON-WHANGPOA RAILWAY.—The British minister at Peking has demanded of the Wai-wu-pu to instruct the Viceroy of Two Kuang Province to suspend the work of constructing the Canton-Whangpoa Railway. The cause of British inteference has not yet been made public.

KOWLOON-CANTON RAILWAY.—A severe outbreak of malarial fever has occurred among the coolies engaged in cutting the hill near Shatin for the tunnelling in connection with the construction of the Kowloon-Canton Railway. Hongkong hospitals are reported to be receiving numbers of the laborers daily.

CANTON-AMOY RAILWAY.—Viceroy Shum is reported to have arranged all the right-of-way and will give military protection to all construction camps. The route is from the East Gate to Whampoa and direct to Amoy, a distance of 1,500 ms. The line and company have been registered. Construction may begin sooner than was originally intended.

RAILWAYS IN CHINA.—Great development is taking place in China in connection with railways, and the Chinese themselves are forming companies and raising capital for building the lines. So long as there is nothing in the shape of a concession or exclusive control, the Chinese are willing to cooperate with foreign contractors for the building of the various lines.

PALACE CARS, KINSHIN RAILWAY, JAPAN.—The J. G. Brill Company, Philadelphia, Pa., recently received an order from Japan for five palace cars for the Kinshin Railway. These cars will be of steel underframes, vestibuled and finished and equipped throughout in the most elaborate manner. The firm also received orders from the same road for the steel underframes and trucks for 25 passenger coaches.

FEDERATED MALAY STATES RAILWAYS.—According to the annual report for 1905, by Sir William Taylor, Resident-General of the Federated Malay States, recently issued, the Government spent $6,880,000 on railways, against $6,240,000 in 1904. This included $1,349,505 paid to the Government of the Straits Settlements on the purchase of the Malacca Railway and $2,034,991 expended on railway construction within the federated states. Railways show an increase of 56 ms. constructed during the year, and now total 396 ms.

RAILWAYS IN THE MALAY PENINSULA.—The railways open for traffic in the Federated Malay States extend at present to 396 ms. The total length of the main trunk line from Jahore Bahru to Prai, now under construction in the Province of Wellesley, will be 472½ ms. when completed. At the present moment, exclusive of the construction in Jahore territory, there are 33 ms. odd under construction S. of Tampin, 21 ms. of which are ready for opening. Other lines are contemplated leading N. through Pahang, for which preliminary surveys have already been made, and routes have been explored through Kelantan to Kota Bahru, at the mouth of the Kelantan on the coast of the China Sea.

SOUTH MANCHURIAN RAILWAY.—The cost of necessary work on this scheme is estimated as follows:—Reconstruction or improvement of main line between Tairen and Changchun, and construction of rolling stock, -Y-28,000,000; improvement to Tairen Harbor, -Y-5,000,000; working capital for Fuchum and Yentai collieries, -Y-4,000,000, doubling of track between Tairen and Suchatun, -Y-9,600,000; cost of land and capital for warehouse business, -Y-8,000,000; capital for marine transport department, -Y-10,000,000; reconstruction of line between Mukden and Antung, -Y-22,000,000; reserve fund, -Y-13,400,000. Total sum to be raised, -Y-100,000,000.

MANCHURIAN RAILWAYS.—The reconstruction of the railway between Changtu and Shwang-miao-tsz has been finished and formally opened to traffic. The sections N. of Shwang-miao-tsz will be opened to traffic by the end of October. The repairs to the Southern Manchurian Railway, between Shwang-miao-tz and Kunchuling—a section which was in the most ruined condition when received by the Japanese from Russia—have made so great a progress that they will probably be completed by the end of the current month. The repairing work is also in progress on the Kunchuling-Changchun section. It is believed that the whole line of railway will be ready for the running of trains by the middle of November, or a month earlier than was originally expected.

MECHANICAL SUPPLIES FOR CHINESE RAILWAYS.—The imperial railway management of China expends approximately $1,500,000 gold annually in the purchase of foreign mechanical supplies. In this connection, however, it may be stated that railway materials represent but a small value this year in the matter of the construction of the Canton-Hankow Railway in consequence of the difficulties which have arisen over the line. The value of machinery purchased was about the same as last year, or $95,000 gold. Under this heading considerable development may be looked for in future years. It must be noted that heavy machinery to the value of over $150,000 gold was imported at Canton from Hongkong.

RAILWAY FROM INDIA TO CHINA.—The importance of developing Indian trade connections with China grows yearly, says *Railways* (Calcutta). In an official note on the Burma transfrontier trade routes into Western China Mr. T. C. Wilson, Settlement Commissioner of Burma, writes:—The development of the Western China trade depends upon the mode of transport employed. Under existing circumstances there is an entire absence of trade for 4 mos. in the year, that is, from June to September. During the rains the roads are impassable for pack animals of any description. Last year the heavy rains flooded the country, washed away roads and bridges and caused a block in the opium trade. In the interests of commerce in general and of this province in particular it is very desirable that Bhamo and Tengyueh should be connected by a railway, so as to secure uninterrupted trade communication with Western China. A railway of any description would considerably enhance the importance of Bhamo, which is the emporium for British goods for China, as Tengyueh is for those from China. Another consideration of importance in favor of the construction of a line of railway is that goods could be booked direct from the Rangoon customs office to Tengyueh in bond without breaking bulk at Bhamo.

ELECTRIC LIGHTING, TRACTION, POWER, ETC.

SIAM ELECTRICITY COMPANY, BANGKOK.—The tram cars of this company's lines run on an average 739,386 ms. a year.

TOKYO-YOKOHAMA ELECTRIC RAILWAY.—The construction of the second line of this road has been completed and it is now in operation.

NATIVE CITY, SHANGHAI.—Negotiations are now in progress for the electric lighting of the Chinese City of Shanghai, and the contract for this is likely to go to a German concern.

TELEGRAPH LINE TO MANCHURIA.—China is taking the necessary preliminary steps for the construction of a telegraph line to connect her principal cities with the important commercial centers of Manchuria.

TURBO-GENERATOR IN BANGKOK.—The Siam Electricity Company, Ltd., has istalled a turbo-generator at its power station which makes 1,800 r. p. m. at a pressure of 150 lbs. per sq. in., and generates 500 kws. of current.

ELECTRICALLY-DRIVEN PAPER MILL, JAPAN.—Messrs. Mitsui & Co. have arranged to establish a large paper mill on the banks of the Tetorigawa River, Kaga Province, from which water-power, electrically driven, will be generated.

ELECTRIC FANS, JAPANESE RAILWAYS.—Electric fans are now fitted in the 1st-class carriages on the Imperial Japanese Government Railways, and a trial of a ventilator intended for 2d-class carriages has been made with satisfactory results.

ELECTRICAL POWER PLANT, SHANGHAI.—The contract for the supply of the new machinery and plant, required by the municipal electrical department of Shanghai to enable it to provide power for the tramway service, has been placed with Messrs. Bruce, Peebles & Co.

JAPAN-AMERICA CABLE SERVICE.—Since the opening of the direct cable service between Japan and America on August 1st, from 100 to 280 messages have been despatched over the line every day, and the income to the Japanese Government amounts to -Y-16,000 a month, or about -Y-200,000 a year. Before the service was opened the Government paid from -Y-100,000 to -Y-200,-000 each month to the Great Northern Telegraph Company.

PUBLIC AND PORT WORKS, DOCKS, ETC.

FLOATING DOCK, JAPAN.—The Kawasaki Dockyard Company, Kobé, has decided to build a floating dock of 15,000 tons, at a cost of -Y-?50 000

WATERWORKS, NEWCHWANG.—The concession for the supply of water to this city has been secured by an Englishman, and British capitalists will be offered the investment.

CANTON WATERWORKS.—More than 2,000 coolies are now employed on the construction of the new waterworks plant at Canton and four reservoirs have been dug out near a place called Tsangpoa.

GOVERNMENT WATERWORKS AIDS, JAPAN.—The Government aids to cities in Japan for the construction of waterworks in Moji, Niigala, Hiroshima, Osaka, Otaru and Nagoya, for the next fiscal year, will total about -Y-800,000.

WATERWORKS AT DALNY.—The Japanese authorities are contemplating the enlargement of the waterworks at Dalny. Originally built by the Russians, the works were damaged during the war and repaired since the occupation by Japan.

CHEMULPO (KOREA) WATERWORKS.—A plan is on the way to construct waterworks at Chemulpo. The water will be derived from Hangang, and reservoirs constructed on the banks of the Yöngsan. Land for this purpose has been acquired.

HARBOR INVESTIGATING COMMITTEE, JAPAN.—With a view to perfecting the harbor accommodation and opening new harbors to cope with the requirements of the development of the country, the Japanese Government has appointed a harbor investigating committee.

MEGANE BRIDGE, TOKYO.—This structure, one of the landmarks of Tokyo, is to be destroyed in order to make way for the station of the Kobu Railway. The company has undertaken to enlarge the Shohei Bridge, to compensate for the removal of the Megane. The work is now under way.

ANOTHER DOCK, SHANGHAI.—The Shanghai Engineering Company will soon begin the construction of a new dock on the Shanghai side of the Whangpoa, on the site of its present work, as soon as the assent of the harbor and conservancy authorities is obtained. The dock will take in ships up to 320′ with a draught of 20′. The company has a reserve fund equal to its capital of Tls. 120,000.

CONSTRUCTION OF ROADS, NORTH CHINA.—It has been decided by the Chinese authorities to begin the construction of public roads outside of the foreign settlement of Shanghai, immediately. Surveyors have begun to work out the proposed roads, which are to be of a uniform width of 50′ (Chinese measure), including sidewalks, the latter of which are to be 8′ (Chinese measure), on either side of the road, thus making the road proper 34′ in actual width. Householders are warned that dwellings standing in the way of the proposed roads have to be taken down and removed.

BREAKWATERS AND WHARVES, YOKOHAMA.—Baron Mitsui Hachiroemon has asked permission of the Japanese Government to reclaim 95,085 *tsubo* of land at Yokohama from the sea. The cost of the undertaking is set down at -Y-4,541,205. It is intended, if permission is granted, to construct breakwaters and wharves. The area that is to be reclaimed extends from the E. breakwater of the custom house and the right bank of the Shin Ikutagawa. Starting at the E. end, a breakwater, 195 *ken* in length, will be built. The outer or E. side will be used as a regular breakwater, while a wharf, 180 *ken* in length, will be constructed along the inner side. This will be called breakwater No. 1. Starting at a point about 75 *ken* W. of this breakwater, breakwater No. 2 will be constructed parallel to No. 1. The second wharf will afford accommodation to vessels on both sides and will be 100 *ken* IN LENGTH.

KAWASAKI DOCKYARD ACTIVITY.—The Kawasaki Dockyard Company, Ltd., is at present working its plant at high pressure, according to the *Kobé Herald*, the following list of vessels being under construction:—Osaka Shosen Kaisha, two steamers of 2,500 tons each to complete next spring; Hunan Steamship Company, one steamer of 1,500 tons, to complete this (October) month; Nippon Yusen Kaisha, three steamers of 3,500 tons each, to complete next winter and spring, and two steamers of 8,700 tons each, to complete in 1908; Viceroy of Hukuang, six gunboats of 740 tons each, to complete next winter and spring, and four torpedo boats, to complete in the same time; Japanese Naval Department, one despatch boat of 1,251 tons, to complete in 1907, and one destroyer of 350 tons, to complete next spring; Viceroy of Liangkiang, three gunboats of 600 tons each, to complete in 1907; Siamese Naval Department, one destroyer of 380 tons, and three torpedo boats, to complete in 1907.

PUBLIC WORKS, SINGAPORE.—The Singapore Municipality is raising a loan of $1,600,000 at 4½ per cent for the following public works:—Raising dam, $10,485.84; Stamford Canal, $66,826.42; Completion of filters 11-12, $9,962.81; purchase of Worthington pumps, $82,724.93; new water mains, $100,000; electric power installation, $200,000; new cinerators, $35,000; Pearl's Hill reservoir, $55,000; Mahomedan Cemetery, $60,000; Tanjong Katong-rds, $75,000; Cantonment-rd, 25,000; salt-water system for street sprinkling, $150,000; Bididari Cemetery laying out, $50,000; bridge over Singapore River, $140,400; quarantine camp, $100,000; Kalang Tunnel, $140,000; new markets and extensions, $130,-000; fire stations, $70,000; purchase of land for street improvements, $50,000; reforming town drains, $50,000. In response to a question recently propounded in the Legislative Council at Singapore as to the list of public works the Government was to undertake in the Straits Settlements, the Colonial Secretary replied:—The works it is proposed to carry out: are (*a*) Singapore River improvement, $4,650,000; (*b*) extension of Penang Pier, $1,260,000; (*c*) Lagoon Dock, $7,000,000; (*d*) reconstruction of wharves, $6,900,000; (*e*) graving dock, $3,300,000

SINGAPORE HARBOR IMPROVEMENTS.—At the recent annual meeting of the Singapore branch of the Straits Settlements Association, the committee re-

ported on the expropriation of Tanjong Pagar and the question of the harbor scheme. With regard to the latter the committee decided not to oppose the construction of the inner moles, provided the Singapore River was at the same time proceeded with and as long as the proposal to construct the outer moles was not revived. Later on, however, after the Tanjong Pagar arbitration award was published, a majority of the committee came to the conclusion that in view of the altered financial outlook caused by the Tanjong Pagar award it was necessary in the best interests of the colony that the work of constructing the inner harbor to the roadstead, as designed by Messrs. Coode Son & Matthews, be postponed, and that the money contemplated to be expended thereon be diverted towards providing the money required for the improvement and development of Tanjong Pagar. A copy of a resolution embodying the salient features of the report was forwarded to the Government of the Straits Settlements and to the colonial office in London.

SHIPBUILDING, MARINE, ETC.

Destroyer "Yamahiko," Japan.—This warship (ex-*Riesitelni*) has undergone repairs at Nagaura, Japan, and is now at Yokohama.

Equipment of Destroyers, Japan.—The equipment of the destroyers *Shirotaye* and *Nowake* is expected to be finished in December.

Osaka Shosen Kaisha.—This company has determined to make Yokohama the terminus of its present Kobé-Hankow line instead of Kobé.

Naval Vessels, Japan.—The Navy Department of the Japanese Government contemplates the sale of various vessels which have become obsolete and worn out.

Straits Steamship Company.—The Straits Steamship Company's new steamer *Perak* has inaugurated a new service from Penang to Port Swettenham and Singapore.

Mining Vessel for Siam.—Messrs. Howarth Erskine, Ltd., of Singapore, have delivered to the Siamese navy a twin-screw composite mining vessel. Her length is 62′ 6″ over all, breadth 4′, and depth 6′.

Drydock "Dewey."—The United States army transport *Kilpatrick* received a thorough cleaning and out-board overhauling in the floating dock *Dewey* at Olongapo, before she sailed for New York the fore part of the present month.

Measurement of Winds at Sea.—Mr. Shinrin Baba, a Japanese, has invented an instrument which is said to record with a great accuracy the strength of the wind at sea. It has been tried on board the *Taisci-maru* and found most successful.

Kerosene as Maritime Fuel.—The Toyo Kisen Kaisha has decided to use kerosene instead of coal on two of its steamers now under construction in Japan. The company is also contemplating the use of oil on the *Nippon-maru* and its other Pacific liners.

Turbine Monopoly in the Orient.—It is announced that the Mitsu Bishi Dockyard and Engine Works, Nagasaki, have purchased the monopoly of the turbine machinery in the Orient. The engines of the turbine system will be used on board the new Japanese despatch boat *Mogami* and the proposed volunteer vessels.

New Vessels for Hankaku Railway Company Japan.—This company has decided to purchase several steamers to cope with the great increase in traffic, both passenger and freight, which has resulted since the opening of the line to Maizuru. The vessels are to have a displacement of 800 tons each, and to meet this outlay the company has issued debentures to the amount of -Y-200,000.

Japan-Vladivostock Service.—Negotiations are being carried on by Japanese shipowners with the Eastern Asiatic Steamship Company, Vladivostock, with a view to a fare and freight arrangement between Vladivostock and Japanese ports. The steamship company proposes to maintain its service between Tsuruga and Vladivostock even in winter, and is constructing another ice-breaker for that purpose.

Refloating Sunken Vessels, Port Arthur.—The work of refloating sunken vessels has been nearly completed by the Japanese at Port Arthur, although the 21 steamers which were sunk to blockade the entrance of the harbor have not so far been brought completely to the surface with the exception of the *Yahiko-maru*. They are not being raised in parts, and it is not expected that the work will be completed before February next. Steamers are forbidden to enter the harbor by nights.

Toyo Kisen Kaisha.—This company has ordered the construction of a vessel of over 10,000 tons for its American service, and three vessels of 8,000 tons each. As the Mitsu Bishi Dockyard and Engine Works, Nagasaki, were unable to accept the commission, on account of other work, the Kawasaki Dockyard Company, Ltd., Kobé, has been asked to undertake the work, and it is believed that the contemplated immediate extension of the dockyard will enable the Kawasaki concern to accept the order, independent of the fact that it also has a large number of vessels now in hand.

Nippon Yusen Kaisha.—This company has lowered the 1st-class fare between Yokohama and London, as follows:—Ordinary ticket to be issued at Yokohama, -Y-500; return ticket, -Y-500 and £44. Ordinary ticket to be issued at London, £55; return ticket, £55 and -Y-400. The company, moreover, has inaugurated a world-round service. Steamers from Hongkong, Shanghai and Japanese ports will sail direct for Seattle, whence passengers will be conveyed to New York or Montreal by the Great Northern or the Northern Pacific railroads, to be taken to London by Atlantic liners. The return voyage will be *via* the Suez route.

New Nippon Yusen Kaisha Steamers.—Details of the increase in the fleet of this shipping company by twelve steamers are gradually being made public. Three of the new vessels are for the Japan-Shanghai line, and are being built by Messrs. Henderson & Co., England. Of these the *Awaji-maru* has been launched. The other two, *Chikuzen-maru* and *Chikugo-maru*, will be launched this month and in November respectively. Three other steamers for the Yangtsze River service (3,000 tons each), which are now under construction at the Kawasaki yards, will be launched in December, this year, and January and March, next year, respectively. The substitute for the *Hitachi-maru* (6,550 tons) will be launched from the Mitsu Bishi Engine Works, Nagasaki, towards the end of November. The company has recently placed orders for two European liners with the Kawasaki Dockyard Company, Ltd., and four with the Mitsu Bishi Engine Works, each steamer to have a displacement of 7,000 tons. They will be completed in 1908.

Shipping at Saigon.—The British vice-consul at Saigon, Mr. J. L. O'Connell, in the course of his annual report on the trade of Cochin-China, gives the following table of the tonnage cleared from Saigon during the years 1886-1904, a comparison between the four principal nations engaged in the trade:—

	French.	*British.*	*German.*	*Dutch.*
1886	228,871	231,475	94,638	51,326
1887	243,649	222,915	77,985	40,727
1888	237,367	194,438	141,349	32,274
1889	217,581	130,636	100,020	....
1890	214,866	173,169	147,317	....
1891	218,738	153,135	124,088	13,028
1892	222,235	190,987	157,365	7,690
1893	207,050	202,444	206,419	20,795
1894	228,202	178,550	153,921	30,400
1895	239,256	177,730	168,021	7,338
1896	245,399	155,366	160,194	1,415
1897	238,652	185,768	174,910	....
1898	288,895	199,078	144,665	4,367
1899	319,274	199,327	129,239	5,161
1900	347,735	169,977	177,190	6,745
1901	345,012	174,733	188,078	7,237
1902	473,264	204,931	231,169	4,712
1903	476,298	89,379	135,078	4,775
1904	519,993	424,919	212,827	3,477

The miscellaneous tonnage during this period rose from 24,000 to 161,000 tons, and the total tonnage from 630,865 to 1,322,776 tons.

MINES AND MINING

Mining School, Korea.—The Korean authorities have decided to establish a mining school at Seoul. The instructors will be Japanese.

Mining Charters, Korea.—Applications thus far received by the Korean Government for charters for working mines number nearly 175. Over 160 of these are from Japanese.

Heilungchiang (China) Gold Fields.—It is semi-officially stated that the Russian Government has instructed its minister at Pekin to restore the Heilungchiang gold fields to China.

Mining Rights, Federated Malay States.—According to the *Times of Malaya*, the option given to Messrs. Behn Meyer & Co., of Manila, Singapore and Penang, of acquiring the Sungei Besi mining rights, is said to be for the amount of £1,000,000.

Cowie Harbor Coal Company, B. N. B.—This company is reported to be making good progress. It has already shipped more than 400 tons of coal, principally by local coastwise steamers. The output is expected to fully realize expectations, according to Mr. R. W. Clarke, the manager.

Abuta Iron Mine, Japan.—The prospects of the new Abuta iron mine at Iburi, Hokkaido, which began operations last year, are good. The mine contains iron-ore at the rate of 56% and the ore is refractory. The Wakamatsu iron factory has contracted for a supply of some 80,000 tons from this mine.

Value of Fushun Mines.—A mining expert, who has just completed a report on the Fushun coal mines, estimates that the supply is almost inexhaustible, and that the quality of the coal far surpasses that of many of the best mines in Japan. He values the mines, which are located in Manchuria, at -Y-500,000,000.

Mineral Deposits in China.—The flotation of companies to work mineral deposits in China seem to have commenced in real earnest, but in the present attitude of the Peking Government there appears to be no security for foreign capital. Even when the concessions are absolutely secured, the composition of the boards of directors is not such as will command the confidence of foreigners.

New Japanese Gold Mines.—The Hakko Kizan Kwaisha is the name of a gold-mining company which has lately been organized in Tokyo with a capital of -Y-500,000 to work extensive gold mines in Hakko-zan, a mountain range extending to Higashishirakawa-gori, Fukushima-ken, Nasu-gori, Tochigiken, and Kuji-gori, Ibaraki-ken. In the experimental boring 20 to 30 mommée of gold have been daily obtained.

Kiangpei Concessions Ltd., Shanghai.—The name of this concern has been changed to the Kiangpei Ting, Coal and Iron Mining Company, Ltd., because the Chinese officials of Szechuan Province objected to the worn Concession. It is a British-Chinese concern organized for the purpose of developing the Longwangtong mines. Mr. Archibald Little is now preparing to construct a light railway from the mines to the Kialing River, a distance of 40 *li*, to facilitate the export of the excellent Kiangpei coal.

Dutch Borneo Oil Output.—Statistics of the Dutch Borneo oil output show that 92,330 tons of crude oil were produced the second quarter, and 207,620 tons in the first half of the present year, as compared with 191,090 tons in the corresponding period of 1905. The shipments of kerosene in the first quarter were 38,502 tons, and of other products 34,140 tons, and in the first half of the year 61,835 tons of kerosene and 61,783 tons of other products, as against 60,420 and 67,263 tons in the corresponding half of 1905.

Mining Operations in Japan.—Mr. Furukawa, who owns most of the gold, silver, copper and iron mines in Yamagataken, has made elaborate arrangements in order to increase the output of the various workings under his control. Two Tokyo capitalists are also actively engaged in opening up copper and zinc mines in this district, while others are also making preparations to work the gold mine in the neighborhood of Hijiori-mura Hot Springs, in Mogamigori. This mine is generally believed to be a rich one.

New Korean Mining Law.—Ambassador Luke E. Wright, in forwarding to Washington from Tokyo an official translation of the mining law of Korea, which was promulgated July 12th, calls attention to the following articles which apply especially to the interests of foreigners in that country:—

Art. 27.—Inasmuch as the measures to be taken under the present law and the detailed regulations for carrying out the same will in many cases concern foreigners, no such measures shall be decided upon or executed without the previous consent of the resident-general. This stipulation shall also apply with regard to the mines belonging to the imperial household department.

Art. 30. Foreigners who have been granted mining rights and have begun operations in connection therewith before the promulgation of the present law and are still carrying on such operations, shall observe the provisions hereof so far as they do not conflict with the terms of the grants made to them.

Siberian Mining Concessions.—The Russian Government offers to all companies or persons desirous of sending prospectors to Cape Chukotski, Eastern Siberia, for mining purposes, to obtain for them the lease of one or more claims, same to be chosen and located by them and to remain in the possession of the lessee, his heirs and legal representatives, successors and assigns, until the mine is exhausted—if they comply with all the conditions of the contract signed with the company. Whereas:—(1) According to the Russian mining laws, mining on the Chukotski Peninsula and in the whole of the Primorsk Province is prohibited to foreigners; (2) Under the contract signed with the Russian Government, the Northeastern Siberia Company, while having the sole right, until 1910, to prospect for minerals and work mines on the Chukotski Peninsula E. of the rivers Angeioma and Ennenkal, can transmit that right to other persons only by special permission and in its entirety, without parceling the concession into separate claims; and (3) It will be possible for the company, under the general mining laws and under the stipulations of the abovementioned contract with the Russian Government, to transfer such claims only after the above-mentioned term of exclusive rights in the whole of the peninsula shall have expired and after the allotment to the company of such separate localities which the said company may wish to retain; *Therefore*, the Department of Commerce and Industry warns all persons who have already entered or are desirous of entering into agreements with the Northeastern Siberia Company, with a view to leasing claims on the Chukotski Peninsula, that the Imperial Russian Government will not admit or recognize the rights of such persons to these claims, although the same be based on agreements or contracts concluded with the above named company.

FINANCIAL AND MISCELLANEOUS

Toyo Kisen Kaisha.—The net earnings of this company for the first half of the current year were -Y-70,165.

Nippon Industry Encouragement Bank.—This concern has decided to issue further debentures of -Y-1,000,000.

Korean Cotton Company.—Capitalists of Osaka are organizing a Korean cotton company with a capital of -Y-200,000.

Paknam (Siam) Railway Company.—The profits of this company for the first half of the current year were Tcs. 53,659.32.

Tokyo Clearing House.—The deposits in the associated banks of the Tokyo Clearing House are reported to have reached an aggregate of -Y-200,000,000.

Flour-Milling Enterprise.—Japanese capitalists are arranging to establish flour mills at Tokyo and Hankow, China. The company has a capital of -Y-2,000,000.

Shanghai and Hongkew Wharf Company, Ltd.—This company has decided to issue 4,000 new shares on terms communicated to the shareholders by circular.

Miyakejima Products Company, Japan.—This company has increased its capital from -Y-30,000 to -Y-300,000, and will establish factories at Oji and in Hokkaido.

Yokohama Sugar Refining Company.—This company has been organized with Messrs. K. Abe, M. Masuda, K. Masuda, Z. Tanaka and Konosuke Abe as directors.

Engineers to be Selected.—The Premier of New South Wales has authority to select ten engineers, with salaries ranging up to $5,000 gold each, for a large engineering work.

Eastern Asia Flour Mill Company.—This is a Japanese company with an authorized capital of -Y-3,000,000. It aims at conducting its business both in Japan and China.

Iwashiro Sulphur Company.—Iwashiro Province (Japan) capitalists, headed by Messrs. Motoyama & Okabe, have organized this company. It has a capital stock of -Y-500,000.

Yokohama Specie Bank.—The net profits of this institution for the first half of the current year were -Y-3,363,908.04. The interim dividend was at the rate of 10 per cent *per annum.*

Japanese South American Consulates.—The Japanese Government has determined to establish consulates in South America, to develop commerce and emigration to that country.

South Manchurian Railway Receipts.—The daily receipts of the South Manchurian Railway at present average about -Y-13,000. Over 7,000 persons are now employed regularly on the line.

Tobacco Monopoly, Japan.—The tobacco crop of Japan this year is estimated at 15,000,000 *kwanme* (*kwa.*, about 3¾ kilos), being an increase of more than 20 per cent over an average year.

Another Insurance Company, Japan.—Messrs. A. Fukuhara, K. Makoshi, S. Hiranuma and other Japanese capitalists, are organizing a fire insurance company at Tokyo with a capital stock of -Y-5,000,000.

Hotel Scheme, Tokyo.—The aldermen's council of Tokyo has been asked by Mr. Nakano, president of the Tokyo Chamber of Commerce, for a loan of -Y-300,000 for the purpose of building a hotel.

Tokyo Stock Exchange.—*The Japan Times* says that the delivery of shares on the Tokyo Stock Exchange at the end of August broke the record in amount. It numbered 130,850 shares, valued at -Y-10,443,490.

Austrian Bridge, Tientsin.—The remaining parts of the new Austrian bridge under construction at Tientsin have arrived there and it is believed the structure will be opened to traffic before the end of the current year.

Yokohama Waterworks Loan.—Messrs. Samuel Samuel & Co. have made overtures to the Yokohama municipality to the taking up of the waterworks loan, amounting to -Y-3,000,000, which is to be issued by the city.

Chartered Bank Dividend.—The directors of the Chartered Bank of India, Australia and China have declared an interim dividend at the rate of 13 per cent *per annum,* free from income tax, for the half year ended June 0th last.

Chambers of Commerce, China.—Most of the larger towns in the Province of Chekiang are establishing chambers of commerce. These are semiofficial bodies, being under the supervision of the local bureau of agriculture, trade, industry, and mines.

Tokyo Spinning Company.—This company is about to increase its capital of -Y-1,200,000 to -Y-4,800,000. The object is to extend the plant to 500 looms and 60,000 spindles, which will involve an immediate addition of 125 looms and 30,000 spindles.

Industrial School, Seoul.—The Japanese and Korean authorities have decided to establish an industrial school at Seoul. The initial expenses are estimated at -Y-200,000, and the annual expenses at -Y-40,000. Among the sciences taught will be civil engineering.

Water Power Electric Company, Yingkow, China.—This company, which has been formed by Japanese with a view to developing various industries in China, with electricity for power, has a capital of -Y-2,000,000. The head office of the company is in Tokyo.

Tokyo Electric Power Company.—The organizing general meeting of this corporation was held recently, and the following officers elected:—President, Mr. Tokunori Asada; directors, Baron Shibusawa and Messrs. K. Ohura, S. Asano, M. Tachikawa, T. Nakane, and T. Okochi.

Cotton Milling in Shanghai. The cotton mill business in Shanghai is making good progress. At present the spindles number about 300,000, of which 100,000 are owned by the Chinese, 100,000 by the British, 50,000 by the Japanese, and 40,000 by the Germans. The trade in general is most active at present.

Tsukijima Rope Manufacturing Company, Japan.—This company intends to extend its business by issuing new shares and also to establish a wire-rope factory. The directors are reported to be negotiating with representatives of the Tokyo and Susaki rope manufacturing companies with a view to the amalgamation of their interests.

Glass Factory, Osaka.—A scheme is on foot to establish a large glass factory at Osaka, under joint ownership of Japanese and Belgians. The capital will be -Y-1,500,000, of which sum -Y-1,000,000 will be subscribed by the Belgians and French, and the balance by Japanese. The patent Belgian window plate glass will be manufactured.

Cement Manufactory, Canton.—It is announced that Chinese capitalists of Canton have acquired a site for the erection of a large Portland cement factory. A kind of limestone, said to be suitable for cement manufacture, has been found on a hill in Fa Yuen District, where a branch factory will be put up to supply the main works.

Shanghai Oil Company, Ltd.—This company has secured a little more than 12 *mow* of land at Jessfield. The contract for its building has been let, the foundations completed, and the walls are already under construction. The buildings are expected to be finished by the time the machinery arrived, the installation of which will be pushed as rapidly as possible.

Industrial Bank of Japan in Korea. According to *The Japan Times*, the Japanese authorities have decided to appoint the Industrial Bank of Japan agent for promoting the industry and agriculture of Korea. The bank will make loans not only to various Government works, but also on behalf of individual and agricultural property in the Hermit Kingdom.

Tokyo Kisen Kaisha.—At the recent general meeting of this company a resolution was passed to the effect that the company shall issue during the next year debentures amounting to -Y-3,500,000 in order to pay for a portion of the cost of five cargo boats, valued at -Y-6,000,000. The balance will be made good by the issuance of another batch of debentures at a suitable time.

Singapore Branch, Straits Settlements Association.—At the recent annual meeting of this association, the following officers and committee were elected for the ensuing year:—President, Hon. John Anderson; vice president, Mr. W. G. St. Clair; honorary secretary and treasurer, Mr. Rowland Allen; committee, Messrs. Maclaren, Peirce, Gentle, Eldin, Tan Jiak Kim, Fort, Ellis, and Robinson.

North Borneo Trading Company.—At the ninth ordinary meeting of the directors of this company, held recently in London, it was reported that the trade accounts for the year showed a gross profit of £3,297, and the profit and loss account, after charging all expenses, showed a credit balance of £1,431, which, with the balance for the preceding year, £2,723, made a credit total of £4,154. The company cultivates rubber.

Chinese Imperial Bonds.—The London office of the Hongkong and Shanghai Banking Corporation gives notice that 5,000 bonds, representing £500,000 of the Chinese Imperial Government 5 per cent gold loan of 1905, will be paid off at par on March 1st next. The numbers of bonds to be redeemed will be drawn in January, 1907, and will be in addition to the ordinary annual drawing of 500 bonds, representing £50,000.

Cement Market, Japan.—Reports from Japan are to the effect that the cement market of that country is now very active, owing to the resumption of different works already in course of construction, which were suspended during the war. In the early months of last year prices on cement ruled at -Y-3.20 or thereabouts, per bbl; but they have now advanced to -Y-4.70. It is said that orders are being received in considerable quantity from America, Manchuria and Korea.

Hokkaido Colliery and Railway Company, Japan.—In connection with the loan of £1,000,000 which this company raised in London some time ago, as a result of the nationalization of the railway, the Japanese Government will bear 40 per cent of the loan and the company the remainder, 60 per cent. The directors of the concern have proposed to the shareholders that the name, in view of the nationalization of the road, should be changed to the Hokkaido Colliery Steamship Company.

Reclamation of Agricultural Lands.—Japanese and Korean capitalists have organized at Seoul a reclamation and cultivation company, with a capital of -Y-1,000,000, for reclaiming waste land and improving the cultivation of land already reclaimed but not productive. The company will at once come into limited possession of 34,527 acres in the N. and S. of Kyongsang-do. The land has been actually surveyed and permission to reclaim it has been obtained from the Government.

Johore Planters' Association.—This association was recently organized at Johore, with the following officers:—Honorary president, H. H. the Sultan of Johore; vice-presidents, H. E. Sir John Anderson, K. C. M. G., governor of the Straits Settlements; Sir Frank Swettenham, K. C. M. G., and Hon. John Turner, M. L. C., Penang; chairman, Mr. F. Pears, Lanadron Estate, Muar; honorable secretary, Mr. Staples, Johore Bahru; committee, Mr. E. Valpy, Gunong Pulai, Johore, and Mr. Stanley Arden, Pulau Kukob, Johore.

Cement Contract, Manila.—Messrs. Findlay & Co., of Manila, have been awarded the contract for supplying 30,000 bbls. of their "Alsen" brand of cement to the military establishment of the Philippine Islands to be used for fortifications at Corregidor and Isla Grande, the latter place being in Subig Bay. Other bidders were W. H. Anderson & Co. and E. C. McCullough & Co., Inc., "Green Island" brand; Froelich & Kuttner, "Saturn" brand; H. W. Peabody & Co., "Atlas" brand; Behn Meyer & Co., "Hemor" brand.

Siam Electricity Company, Bangkok.—In 6 mos. this company earned about Tcs. 300,000. There was some difficulty in making the tramway pay because, owing to competition, the Samsen line showed a deficit of Tcs. 40,000. On the other hand the Bangkolem line did better than ever before, and thus permitted the company to balance accounts. The total tramway receipts were Tcs. 787,130. During the past year the company has spent over Tcs. 500,000 in improvements to its plant, etc., and during the past 3 yrs. Tcs. 100,000 were paid out in dividends.

Korean Waterworks Company, Ltd.—The first ordinary general, or statutory, meeting of this company was held recently in London, Baron George de Reuter presiding. The company has a share capital of £250,000, and the whole of the debentures, *viz.*, 2,500 of £100 each, have been subscribed for. The chairman reported that the work of constructing the waterworks plant at Seoul is well under way. The company's resident engineer is Mr. H. G. Foster Barham, who is now believed to be on the ground. Messrs. Livesey, Son & Henderson, London, are the company's consulting engineers, and the work will be done under their supervision.

Yokohama Engine Works, Ltd.—The report of the directors of this company for the year ended May 31st last, was recently presented to the shareholders at their eighteenth general meeting. The net profits for the 10 mos under review amounted to -Y-38,320.80, or an increase of -Y-27,453.80 as compared with the previous 12 mos. This former sum to which was added -Y-13,614.55 brought forward from previous account, left the directors -Y-51,935.35 available for distribution, which it was decided to appropriate as follows:—Dividend at the rate of -Y-10 per share, -Y-26,000; establishment of a reserve fund -Y-20,000; carried forward to next account, -Y-5,935.35.

Paknam Railway Company, Ltd.—At the 30th ordinary meeting of the shareholders of this company, held recently, the following gentlemen were in attendance:—Chairman H. Dehlholm, Luang Sunthorn Kosa, Dr. T. Hayward Hays, Messrs. J. M. Dunlop, J. Robertson, J. McEwen, H. V. Bailey, and Secretary H. A. Tozer. The gross receipts for the 6 mos. were Tcs. 83,237.28 and the expenditures Tcs.29,577.96, leaving a profit of Tcs. 53,659.32. Traffic receipts for the period were the highest on record. In addition to his duties as chairman of the board of directors Mr. Dehlholm has been given the general management of the road.

Zamboanga (P. I.) Customs Receipts.—Zamboanga, the capital of the Moro Province, heads the list of Philippine ports in the matter of increased customs collections. The remarkable improvement in business conditions at this port is best evidenced by the following table which appears in a special report of the insular collector of customs covering the fiscal year, ended June 30th, 1906, which follows:—

1904	₱ 82,240.40
1905	108,719.86
1906	178,818.96
Total	₱369,779.32

German Money Issue in China.—The concession of the German-Asiatic Bank for issuing and circulating bank notes in the German Protectorate of Kiauchou and the German settlements in China, runs for 15 yrs. The bank notes will be of the value of 1, 5, 10, 25, and 50 dollars, and 1, 5, 10, and 20 *taels*. In the Chinese Province of Shantung only notes of the money standard of Tsingtau can be circulated. The dollar, as mentioned in this concession, is the current Mexican dollar or a coin which in general commerce is recognized as equal in value at the various places of issue or is made so by law. The bank agrees to pay 1 per cent *per annum* on the yearly average amount of the daily circulation of the bank notes. The sureties for the security of the notes are the Bank of Commerce and Industry, of Berlin; the Commercial Association, of Berlin; S. Bleichroeder; the German Bank; the Disconto Association, and Mendelssohn & Co., of Berlin.

Hongkong Industries, 1907.—Speaking on the budget of Hongkong Colony for 1907, Governor Nathan recently referred to the industries of the colony, with special reference to the new territories, in the following terms:—"The question of public works leads one naturally to the question of the progress of industries in this Colony. The year promises to be a very important one in this respect. The mining in the New Territory is now apparently advancing beyond the prospecting stage, and if it proves to be the success that its promoters anticipate the colony will benefit thereby. Another great industry which has been started this year is flour-milling at Junk Bay, to which we wish every success. Speaking last year on the subject of industries I referred to the assistance which was given to the promotion of industries by exhibitions. Since then we have completed an exhibition of the products of Hongkong and South China in the imperial institute in London. An exhibition of industrial arts in the colony has been arranged for, and we have also started again the annual flower show."

Government Iron Foundry, Japan.—This industry now supplies almost all the necessary material used in the construction of battleships; yet it still needs capital and work to make the foundry a profitable business. There are employed here 6,000 skilled artisans, and 1,000 temporal hands. The foundry mostly manufactures iron and steel plates, cartridges, building material and rails. The battleship *Aki*, and the cruiser *Ibuki*, now in course of construction, are receiving materials from this foundry. Generally speaking, the foundry, with the present ratio of manufacturing power, sends out of ordinary articles about 90,000 tons yearly, but for such refined articles as are used in building battleships, it can only supply 70,000 tons at present. But when the plan which the Government has projected for the foundry will be completed, it can produce 180,000 tons a year quite easily. In order to regulate the yearly quantity of coal production from the coal-mine in the possession of the foundry, a digging of a pit of 1,000 *shaku* has been devised as the successive work of 5 yrs. It has also begun in setting up another furnace besides the two previous ones. It will be completed next year. Finally the extension of the railway lines which are used for the conveyance of the manufactured articles from the foundry is among the new projects.

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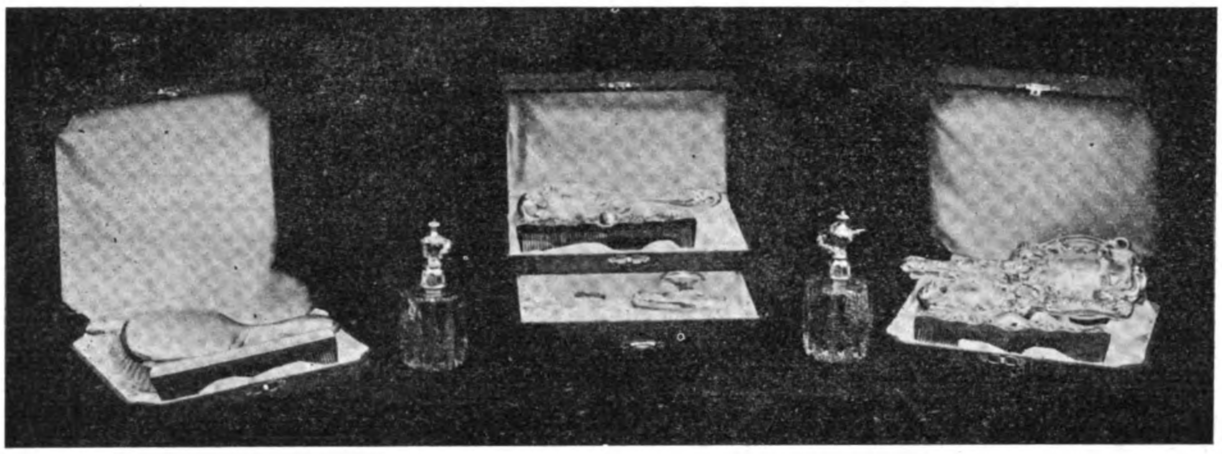

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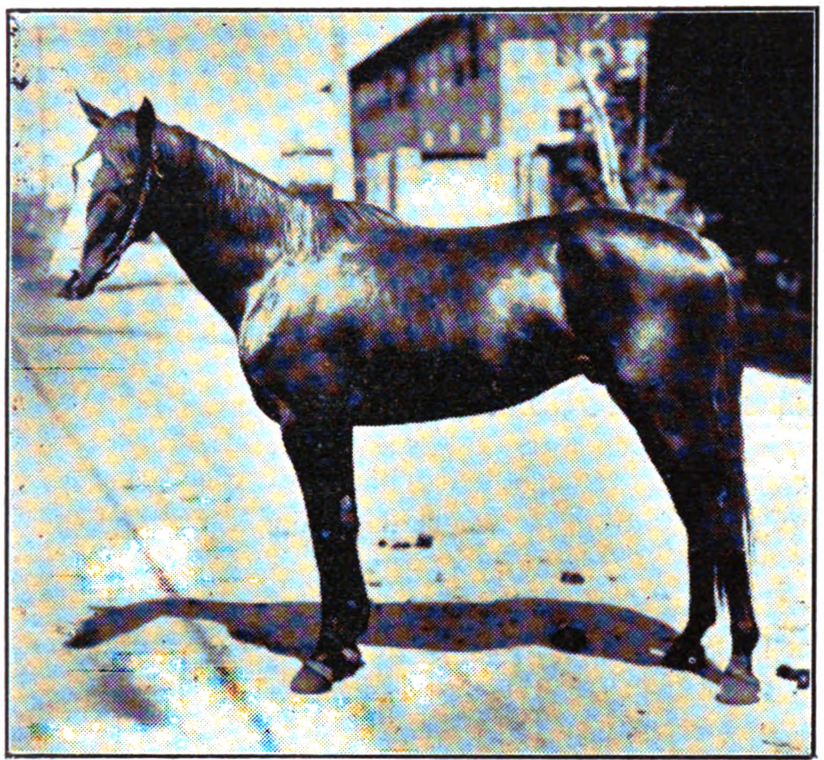

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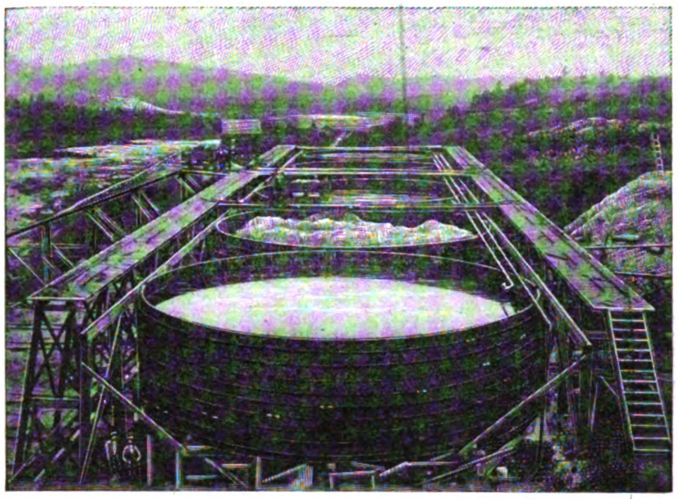

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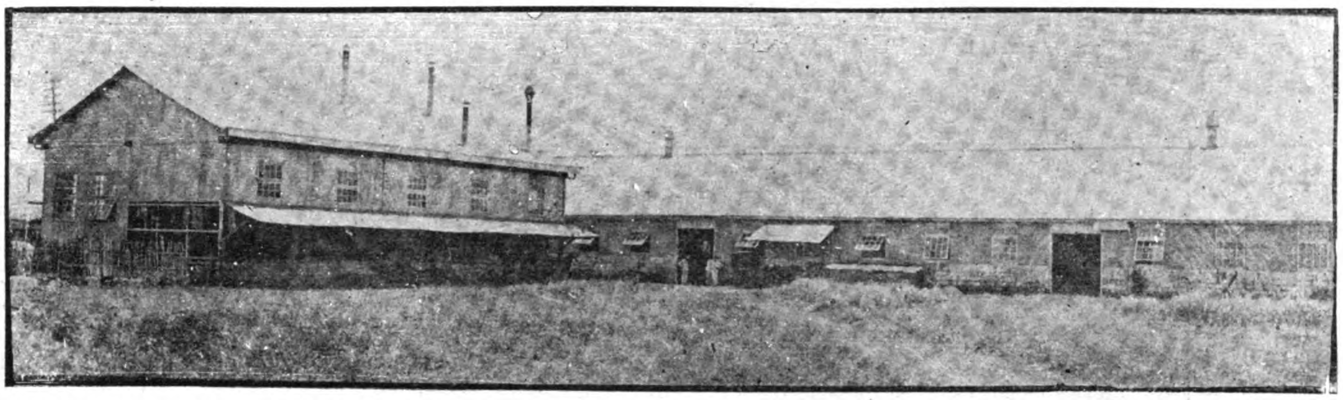

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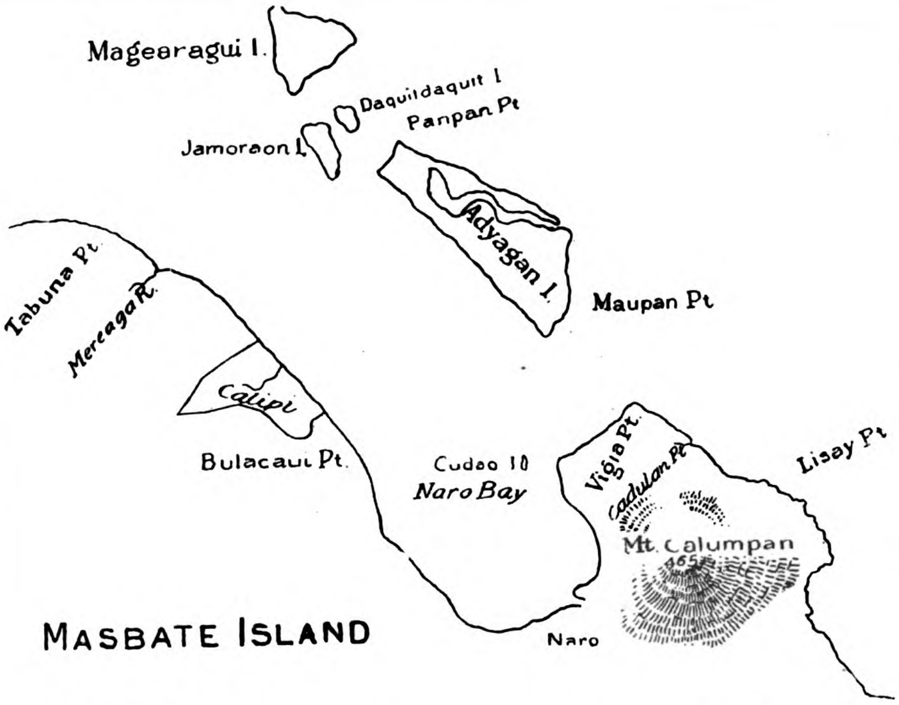

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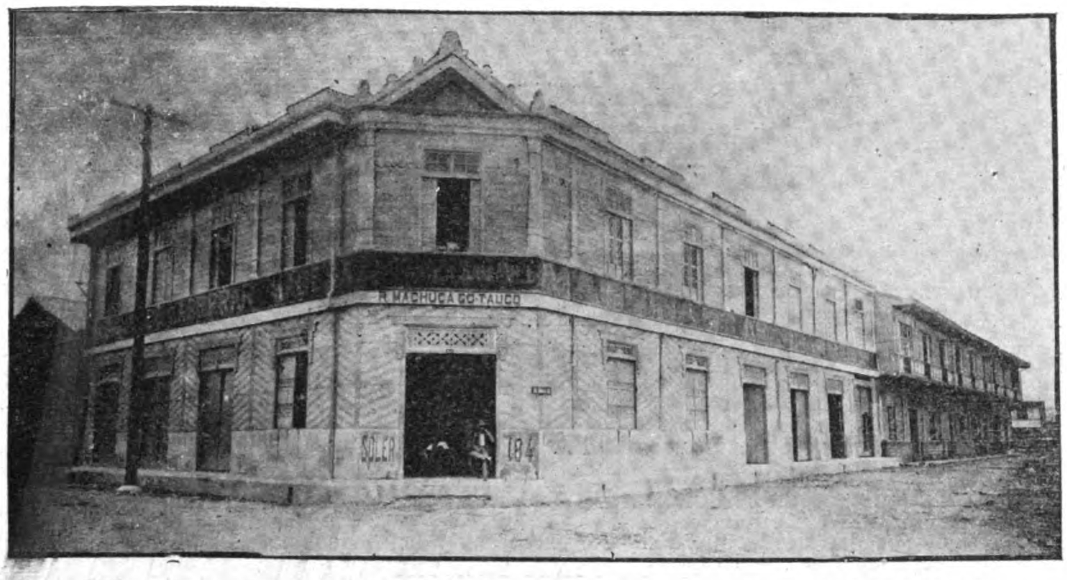

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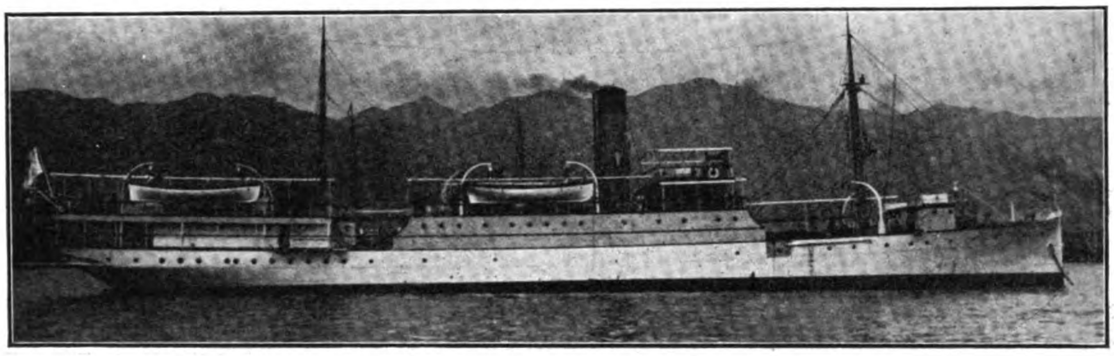

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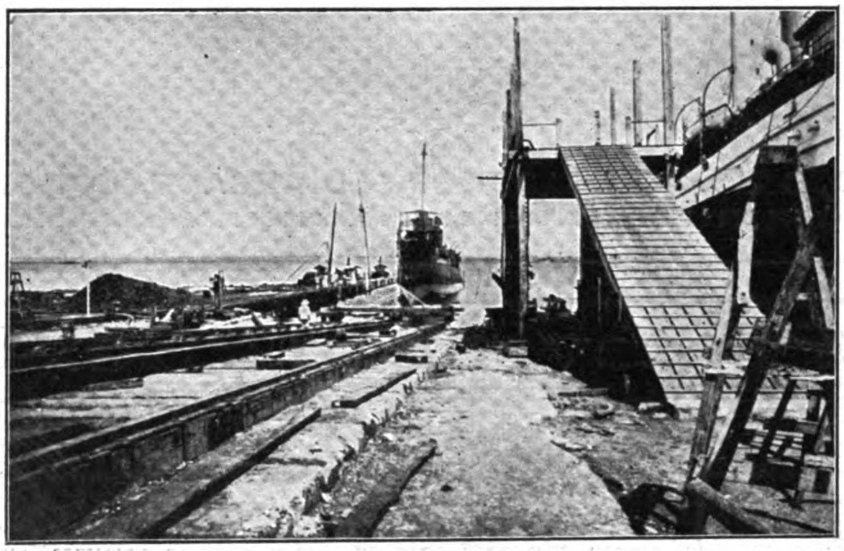

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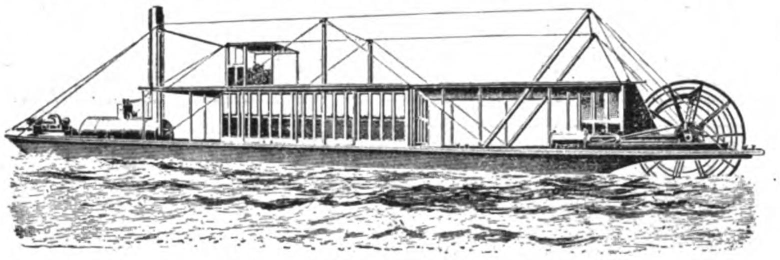

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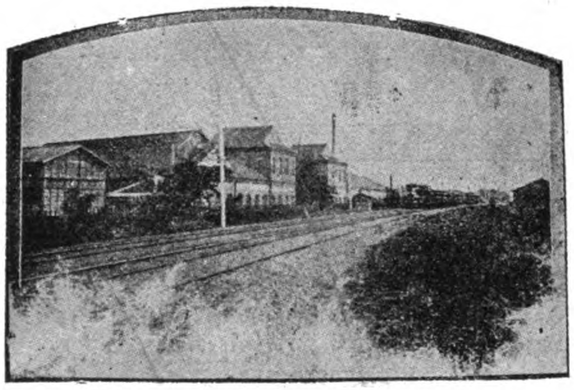

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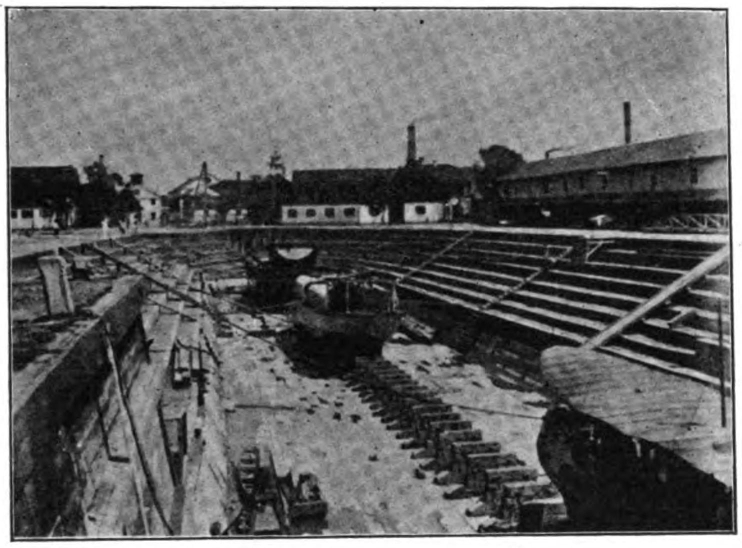

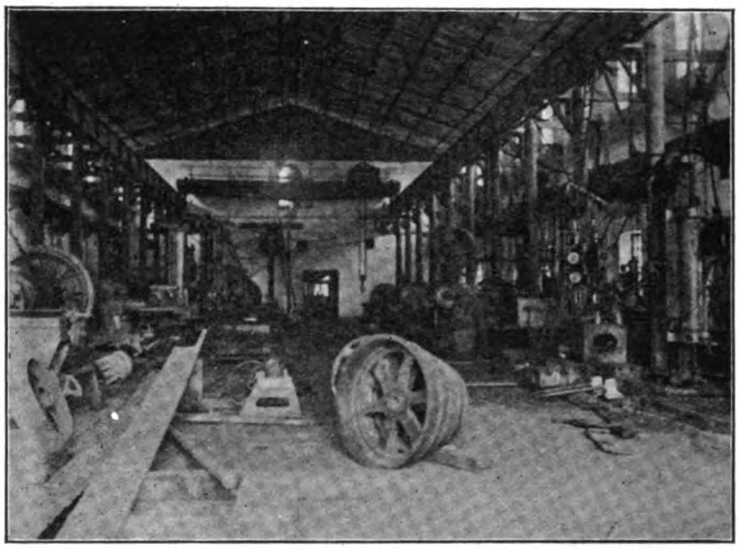

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THE FAR EASTERN REVIEW

COMMERCE ● ENGINEERING ● FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, NOVEMBER, 1906. No. 6.

REINFORCED CONCRETE IN THE CATHEDRAL CHURCH OF ST. MARY AND ST. JOHN, AT MANILA

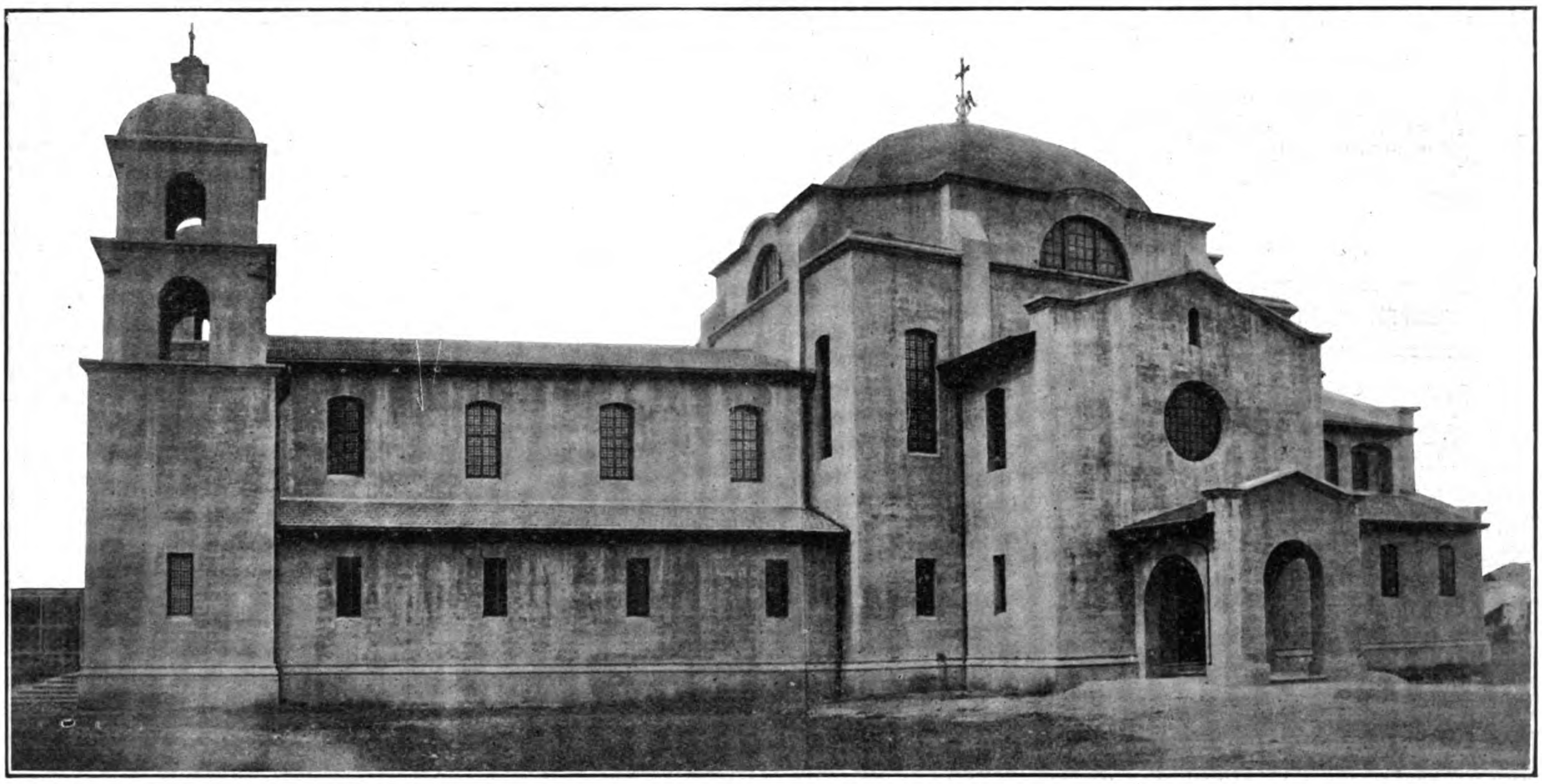
(Constructed under contract by the Atlantic, Gulf and Pacific Company)

The Protestant Episcopal Cathedral Church of St. Mary and St. John, the construction of which has just been completed by the Atlantic, Gulf and Pacific Company, the contracting concern that undertook the work, is not only the most modern and attractive edifice of its kind in Manila, but in the entire Far East. It is, in addition, the first church in the Orient in which the latest approved methods of reinforced concrete construction have been exclusively applied, and for this reason as an engineering and architectural achievement it can not help but attract universal interest and attention.

It is an accepted fact by engineers that reinforced concrete structure, so far as its fire-resisting qualities is concerned, is unsurpassed by any other building material, no exception being made other, perhaps, than the asbestos or firebrick, which are only used for this purpose in those particular lines of industry governed by the application of intense heat. In addition, reinforced concrete buildings are practically earthquake proof. During the recent seismic disturbances in California, concrete buildings everywhere withstood the shocks and were practically undamaged. This was particularly prominent at the Leland Stanford Jr. University, at Palo Alto, where a brick and stucco structure standing alongside of a reinforced concrete building before the earthquake, was entirely destroyed—left nothing but a mass of broken bricks—while the concrete structure stood up perfectly. In most parts of the Orient, particularly in the Philippine Islands and Japan, where a destructive tremblor is liable to occur any minute, this advantage is not to be overlooked.

White ants do not fatten off of reinforced concrete, nor is the material affected by dry rot. As the building increases in age, the concrete constantly grows stronger, chemical changes taking place for a number of years after building operations have ceased. Another advantage is that reinforced concrete lends itself readily to ornamentation of every character; and last, but not least, the cost is not excessive—in fact, not more expensive than a building constructed of superior or 1st-group timber.

Taking all these facts into consideration, and many other advantages it is not necessary to mention at this time, the least that can be said of the Cathedral Church of St. Mary and St. John is that the promoters of this magnificent edifice displayed remarkable wisdom and forethought when they determined for reinforced concrete as their choice of material with which to build.



SOUTH ELEVATION OF THE CATHEDRAL CHURCH OF ST. MARY AND ST. JOHN

STYLE OF ARCHITECTURE.—The Cathedral Church of St. Mary and St. John is the gift of Mrs. Mary Bryant Brandegee, of Faulkner Farm, Brookline, Mass., a former parishioner of the Rt. Rev. Charles H. Brent, Bishop of the Philippine Islands, when he was connected with St. Stephen's Church, Boston. The sum of $100,000 gold was donated for the building, and the architects selected to prepare the plans were Messrs. Sturgis & Barton, of Boston. The plans were submitted to a committee in America consisting of Messrs. Amory Gardner, Charles G. Lawrence, D. Berkeley Updike and Silas McBee. They were executed with great care, and with special reference to the oriental conditions for which they were designed. It was decided by those who had the matter in hand that a gothic building, both structurally and architecturally, would be out of place, and the dignified and classic lines of the Spanish Renaissance were followed. A reminiscence of the simple and beautiful mission architecture of California may be noted in the towers. In order to subdue the rather oppressive massive-

(Continued on page 178.)

THE FAR EASTERN REVIEW

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A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in the Philippines and Far Eastern Countries

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MANILA, SHANGHAI AND YOKOHAMA, NOVEMBER 1906

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GOVERNMENT "SUBSIDIES"

During the last month, rumors, the outgrowth of ignorance of the facts, have reached us to the effect that this paper is a subsidized organ of the Government. Nothing is more foreign to the relations of THE REVIEW with the insular Government. As a medium through which to give publicity to the urgent needs of the Philippines, and to promote our commerce and industries at home and abroad, the Philippine Commission has always regarded THE REVIEW most valuable on account of its high standard, its conservativeness and its solidity; and this has prompted the Government to give to this paper a share of the financial patronage which is appropriated to nearly every other paper published in Manila, regardless of the language or dialect in which it is printed. For every dollar THE REVIEW is receiving it is giving value in return by way of the circulation through the mails of specified numbers of the paper for which there is no other charge; in other words, the Government subscribes to a certain number of papers regularly, for the proper distribution of which our business office must regularly account. The Commission has authorized this patronage since the birth of the paper, the fact of its having renewed its subscription appropriation repeatedly being sufficient proof to us that our own estimation of the value of THE REVIEW as an advertising medium for the Islands is not overdrawn. The columns of THE REVIEW are, and always have been, independent. While our relations with the Government have always been most cordial, and mutually helpful, we have yet to be approached either directly or indirectly by any member of the Commission, or other high official, on the question of editorial policy. It is true that in policy we are pro-Government, but we are not so much so that we must always see only good in the work being done. We have on several occasions criticized acts of prominent officials because we have believed them wrong; we will continue to be just as independent in the future. We do not believe in "flying off the handle" and working ourselves into a tangent over petty politics and smaller trivials that don't look as good to us as they might, because this is out of our line. We are here to look after the immense and broad field of commerce, engineering, finance and industry, and by attending strictly to our field to do all we can towards maintaining American prestige, American influence and American colonial Government as it is being exemplified in the Philippine Islands. Rather than make petty politics the basis of our journalism we would suspend publication. Neither will we have anything to do with international jealousies nor racial antagonism. We want everybody in the Far East, and in the homeland as well, to take an interest in our insular Government, and in the Philippines, and it is to this end we are striving. The Philippine Commission needs our friendship and so do the Islands—and both deserve it and will have it. But this is not promising that the interests of the business community will have none of it. On the other hand, the business man's welfare is our first concern, because without commercial and industrial prosperity in the Philippines and throughout the Orient we can not hope to prosper. So let the originators of street rumor cease to intimate "subsidy" when the relations of THE REVIEW with the Government are discussed. The word has a ring which no self-respecting newspaper worker likes to hear.

PHILIPPINE LAND AND LABOR

A letter signed by the chairman of the committee appointed by the American Chamber of Commerce and sent out with the last number of THE FAR EASTERN REVIEW contained several representations which we believe to be misleading and which we believe should be editorially corrected.

The committee in a moment of enthusiasm speaks of "115,026 square miles of the richest land on the globe." We do not deny that there is some very rich land in the Philippine Islands, but that it extends over the whole surface of these Islands is not in accordance with the facts, as it is well known the Islands are volcanic in character and in many instances of such contour that no cultivation is possible, and in many parts the soil is by no means rich nor to be classed as fertile. On the other hand there are great valleys made by the deposits from large rivers where the soil is deep and crops of great abundance and fine quality can be grown.

But the statement which commands our attention most forcibly is the representation that labor could be obtained for the sugar plantations at from 10 to 20 cents gold per man per day. In a separate part of this paper a correction of this is noted in which the chairman of the committee calls attention to the fact that the words "and subsistence" were omitted, which makes a very great difference, as one accustomed to labor conditions can readily see; but even with that correction people should realize the small amount of money necessary to supply laborers in the Philippine Islands with the frugal meals to which they are accustomed and not get an erroneous idea as to the cost of supplying laborers for the sugar plantations should they plan to start a sugar estate for themselves and on their own initiative. It is true that under the old régime where the laborers lived in a sort of peonage the prices mentioned and even less prices have been paid, but it is also true that when the time for handling the crop comes the sugar plantation owners have great difficulty in getting laborers at very much higher prices; that they have found it necessary to pay a bounty to laborers to come from other islands and even so contracted-for laborers have had a tendency to run away after getting their transportation free; so that the figures run up to many times that cost intimated in the committee's letter. These facts should be borne in mind by any person contemplating establishment of sugar industries in the Philippine Islands.

JAPAN'S GROWING MACHINERY TRADE

Japan continues to lead all other Farthest East countries in the purchase of foreign machinery. The three great machinery-producing countries of the world are the United States, the United Kingdom and Germany, and during 1905 they sold the bulk of these products that Japan purchased. The business exceeded $6,000,000 gold. A study of the Japanese *Year Book*, just issued from Tokyo, reveals a remarkable growth in the importation of this line of mechanical productions. Considering five of the most important items of import under this head—electric motors, locomotive engines, spinning machinery, steam boilers and engines and turning lathes—the United States sold products amounting to $2,813,800, Great Britain $2,414,500 and Germany $895,600. The balance of the trade was apportioned among other countries. Previous to 1896 Japan purchased no electric motors, and in the year only $7,000 worth, and not until 1900 was the $100,000 mark passed. The importation in the calendar year 1905 aggregated $1,227,700. Only $100 000 of locomotive engines were purchased by Japan in 1892, but for 1897 and 1898 the importations were over $2,000,000 for each year. In 1899 the importations fell off to $984,000, but for the past three years has always exceeded $1,000,000. The American and German locomotives are now gaining supremacy in Japan, where the British make formerly led. For six years previous to 1905, the sale of British locomotives averaged $500,000 *per annum* in Japan, but last year they dropped off to less

than $150,000. The following tables show the Japanese importations of motors and locomotives for the last two years:—

ELECTRIC MOTORS

Country	1904	1905
United States	$ 406,000	$ 929,800
Great Britain	114,400	211,800
Germany	110,000	83,100
Other countries	2,000	3,000
Total	$633,000	$1,227,700

LOCOMOTIVE ENGINES

Country	1904	1905
United States	$ 177,000	$ 471,000
Great Britain	847,600	147,700
Germany	117,300	609,600
Other countries	3,000	4,900
Total	$1,145,600	$1,233,200

Steam boilers and engines from abroad came into Japan in 1892 to the extent of only $90,000, but the increase has been steady, last year marking the first step over the $1,000,000-line. The sales of American boilers and engines to Japan more than doubled the 1904 figures. In textile machinery the United Kingdom supplies the major portion of Japan's needs, as she does the other nations of the world. The United States, however, is beginning to export this class of products and sold to Japan last year $14,600 worth of spinning machinery. Japan's heaviest purchases of textile manufacturing equipment were in 1897, when $2,700,000 were thus spent abroad. The year 1892 marked the beginning of this trade by foreign purchase of $178,000 worth of spinning machinery. The importation of raw cotton that year was only one-tenth the quantity in 1905.

The introduction of turning lathes in Japan began in 1896 with $36,000 expenditure. This went up to $413,800 in 1904, nearly half the purchases being made in the United States. Great Britain and Germany then went after this trade, and succeeded in 1905 in selling lathes to Japan $591,800 and $126,800 of value, respectively. The United States, however, held her own, trebling the sales of the year previous. The Japanese importation of spinning machinery, steam boilers and engines, and turning lathes for the past two years was as follows:—

SPINNING MACHINERY

Country	1904	1905
United States	$ 9,400	$ 14,600
Great Britain	376,000	641,300
Germany	12,800	48,300
France	11,000	5,000
Other countries	5,900	400
Total	$ 415,100	$ 709,600

STEAM BOILERS ENGINES

Country	1904	1905
United States	$ 214,900	$ 447,000
Great Britain	626,300	821,900
Germany	8,000	27,900
France	4,200	10,800
Other countries	1,700	8,900
Total	$ 855,400	$1,674,800

TURNING LATHES

Country	1904	1905
United States	$ 290,400	$ 951,400
Great Britain	77,600	591,800
Germany	37,600	126,800
France	8,200	4,500
Other countries	....	300
Total	$ 413,800	$1,674,800

This includes all the machinery imports given by the *Year Book*, minor articles not being stated. The great strides of Japan in the manufacturing world are evident when it is considered that in 1892 the machinery imports amounted to only $367,500 gold; in 1900 they were $1,606,200; in 1904, $3,462,900; and in 1905, $6,161,800. Of this large trade America secured nearly 40 per cent, Great Britain following closely with nearly 32 per cent, and Germany taking third place.

MINING CONDITIONS IN MALAYA

In other columns of this issue we publish a most interesting and comprehensive description of the extensive tin-mining industry of Malaya, with a number of attractive illustrations reproduced from photographs furnished to us by M. Brochier, ex-Director of Mineral Exploitation of the Government of Indo-China.

Under the present régime, the British Protectorate over the Malay Peninsula controls the small states of Negri Sembilan, Selangor, Pahang and Perak, which form the Federated Malay States under the authority of the Governor of the Straits Settlements whose official residence is at Singapore. The present Governor is Sir John Anderson, K. C. M. G., who was appointed April 16th, 1904.

No geological data concerning this Malayan country has been gathered by the British Administration. Any official may be appointed as a supervisor of a certain mining district, his principal duty being to see that the streams of the small rivers of his region are not diverted from the purposes to which they have been assigned. Works up-stream must not be prejudicial to those down-stream, and waters can not be monopolized. Any infringement of the established rules is punishable by heavy fines or by cancellation of license. From such severe regulations it very often follows that a poor stream is all there is for the working of several mines. A Government engineer is placed at the head of all the mining supervisors, and the administration of his department is generally admirable, everything being done to facilitate prospecting, be the prospectors of any nationality whatsoever.

At the head of each of the Federated Malay States is a Resident, besides a few other heads of departments, a magistrate, a collector, etc. The Resident is always an official who has begun his career as an humble civil servant, and when he is called to administer the State he is thoroughly acquainted with the language, customs and manners of the people, not to mention the industrial and commercial resources of the land. In every residency is kept a mining register always open to the inspection of prospectors. This register shows:

(1). The parcels of land which may be conceded by the Government. In countries under British rule everything is methodical, so no mining concessions are granted to work the mountainous region before work in the lower regions has been thoroughly developed.

(2). No mining concession is granted where Government forests exist. The Department of Forestry is very efficient. There are to be seen immense virgin forests, cleared of all plants and trees that have no industrial value. Nothing remains but gutta percha trees and trees that will give the best wood for building purposes, for cabinet work, etc.

(3). The mining concessions already granted, their area, dates of the grants, work done therein, and results of official analyses of samples are recorded.

(4). The work under way, number of coolies employed, and the quantity of tin sold are carefully noted. The selling of tin is under severe control. Every body can not be a purchaser of the metal, a special license being granted for such a purpose and the Government reserving for itself the right to inspect the books.

(5). Few conditions are imposed by the Government for the grant of concessions, but the law has made these conditions absolute. This policy has, during the last years, attracted capital from Germany, Belgium, Australia, America and France, not to speak of British home investments. All concessions must be thoroughly developed within six months after their grant and titles are valid for 25 years. It is thus impossible to retain a concession without working it, and the restriction is made with the sole object of preventing mining-land speculation.

A mining concession in the Federated Malay States gives rights to the extraction of any metal or mineral found on or under the surface of the ground, and to install the necessary machinery for preparing the mineral for the market; the use of the needed land on which to erect houses for the miners, workshops, etc., and also of agricultural land for the cultivation of vegetables and plants necessary for feeding coolies; the exclusive use within the limits of the concession of all the products of the soil such as wood for building and for fuel, rattan, etc., provided same be used for the needs of the concession.

Collectors may grant titles to concessions of not more than 25 acres. For concessions exceeding this acreage but not exceeding 200 acres titles are granted by the Resident of the State. Titles to concessions larger than 200 acres are to be obtained from the Governor-General. For small concessions applications are made to the local authorities forwarding at the same time an approximate map of the concession applied for. If, prior to the application for a concession, the prospector feels doubtful as to the location of a deposit and is thus unable to limit the size of the concession he wishes to obtain, and if he fears to carry out the necessary prospecting work in the presence of his rivals, he may apply for a *permit license* to prospect 500 acres. This permit is always granted and the fees collected for same amount to $25. This precautionary measure will protect the prospector for a period of six months, this time being sufficient for him to locate a deposit and to fix the limits of the concession he desires to apply for.

The minimum number of coolies to be engaged is eight per acre.

Prospectors may also obtain from the office of the Resident a map showing in detail the roads, byways and routes of the State. On this map are indicated all the *rest-houses*. These rest-houses are solid stone or wooden buildings containing about 10 bedrooms well furnished with iron bedsteads and spring mattresses, wardrobes, dressing tables and irreproachably clean linen, etc. A large room is used as a dining room and provisions and wines of all kinds are kept in stock. The price of a room is about 75 cents gold a day, and each meal is charged 37.5 cents gold.

There are some regions, such as the old states of Pahang and Negri Sembilan, where the life of prospectors is not absolutely safe. Where there is danger, posts are erected on which the following is visibly written:—"Limit of protection. The Government assumes no responsibility for travellers who go beyond this limit without previous notice being given to the authorities."

We have cited these most important features of the mining laws of the Federated Malay States to give the reader a better idea of the control by the Government of the tin industry, and to more clearly inform other governments of Oriental countries on the best features of the Malayan laws with respect to the protection or promotion of general mining enterprise.

VACANT COMMISSIONERSHIP

Now that President Roosevelt has withdrawn the appointment of Judge Magoon as Vice-governor-General of the Philippines, the United States insular Commission is again minus one member. Whether there are any candidates in the homeland for the position we are unable to say, but we earnestly hope the President will not look in that direction for the selection of the new commissioner. We believe Mr. Roosevelt should name his man from among competent Americans who have resided in the Philippines and whose experience in governmental affairs has educated him up to local conditions and the needs of the Islands. During the recent assembly of provincial governors in this city, these officials unanimously recommended the Hon. Arthur W. Fergusson, Executive Secretary, to the President for the commissionership. We believe Mr. Fergusson is the candidate best qualified for the position. He has been Executive Secretary to the Commission ever since Mr. Taft and his colleagues inaugurated civil government in the Philippines, and in this capacity has developed not only a remarkable and intimate knowledge of insular conditions, but has demonstrated by profound ability his fitness for greater responsibilities. Mr. Fergusson is possessed of every qualification for an ideal commissioner, and we believe he deserves all the consideration at Washington that is being petitioned for by his friends in the Philippines. If faithful service and close application to Government interests speak for anything, Mr. Fergusson merits this reward. We think he should have been appointed to the Commission long ago, yet if his promotion comes even at this late date we know the President's long-delayed recognition of his merits and ability will strike an unanimously responsive chord in the hearts of the people of the Philippines.

WEST OR MAIN ENTRANCE, SHOWING BELL TOWERS

REINFORCED CONCRETE IN THE CATHEDRAL CHURCH OF ST. MARY AND ST. JOHN, AT MANILA

(Continued from page 175.)

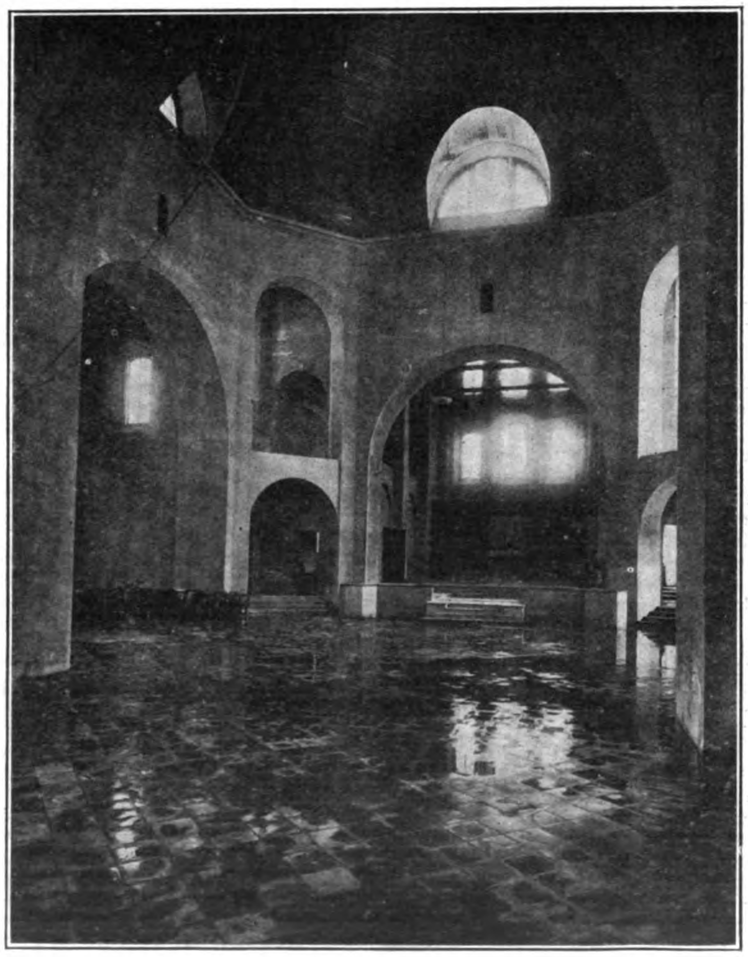
ness of the Renaissance, there is added a suggestion of the more soaring quality of the gothic. As the plans were revised from time to time, they were more and more simplified until the lines which now appear in the completed building were finally evolved. The edifice is intended to gain its distinction from its massiveness and simplicity.

DIMENSIONS AND ARRANGEMENT OF THE BUILDING.—The edifice is cruciform, with dome, and towers on either side of the main entrance. It is spacious, having seating capacity for about 1,000 persons. The main building is 60′ in width over all by 180′ in length, while each wing is 22′ long by 18′ in width. The building proper is 44′ in width. The height of the dome is 76′ above ground-level. It is octagon in shape and measures 50′ in diameter over all. The dome is a steel truss covered with copper. The towers are each 18′×18′ and 57′ in height. Inside of each tower is a circular steel stairway leading from the floor to the cap, which is also covered with copper, secured on wooden frames. The nave proper is 53′ wide over all by 123′ long. The chancel contains the choir vestry, sacristy, above which is the organ loft; the clergy vestry on the north side and a morning chapel on the south side. It is 80′ in length over all by 52′ wide. The ceilings of the nave and chancel are box-panneled. The interior effect of the nave and wings is a mass of arches with a span 28′ in width for the main arches.

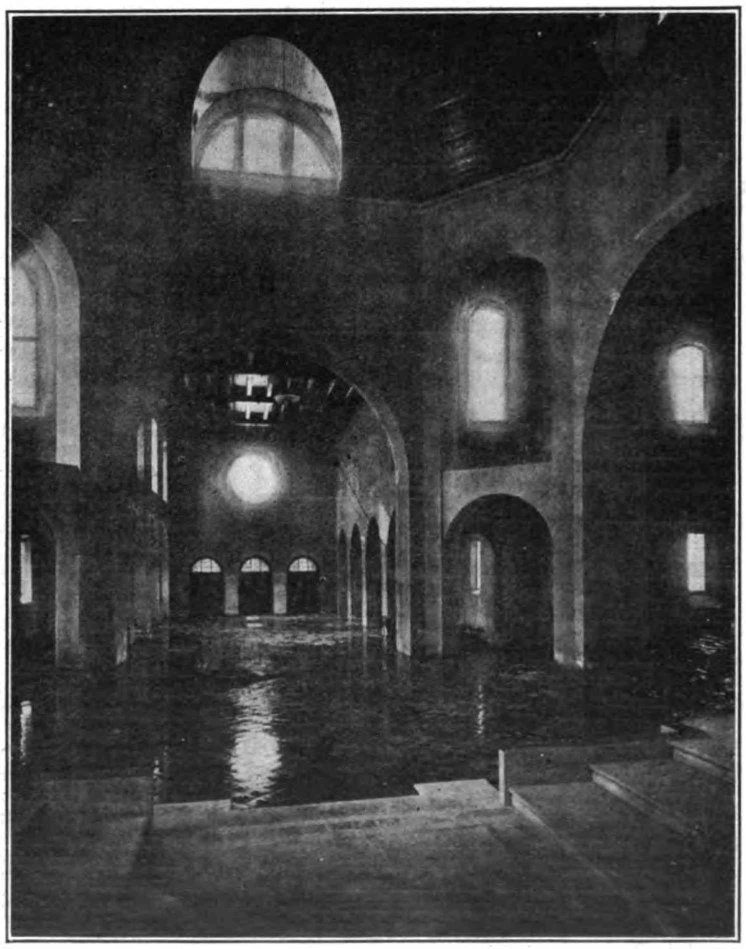
The main roof is supported by heavy wooden trusses covered with flat locking roof tiles, and all gutters, downspouts and incidentals are of copper. The floor throughout is of Philippine cement tiling and all the doors are of native *molave*, a beautiful hardwood, with massive brass trimmings. There is a large porte-cochère at the south entrance to the church.

ABSENCE OF DECORATION.—The interior is devoid of decoration, and it is not the expectation of Bishop Brent to do anything more with the walls than give them a proper tone at such time as the efflorescence has ceased. Stained-glass windows may at some future date be added, but the experiment of using translucent shells set in *molave* frames is an artistic success. Not only does this simple style fit in with the domestic architecture of the country, but it has a distinct kinship with the ground-glass, diamond-pane windows to be found in European cathedrals.

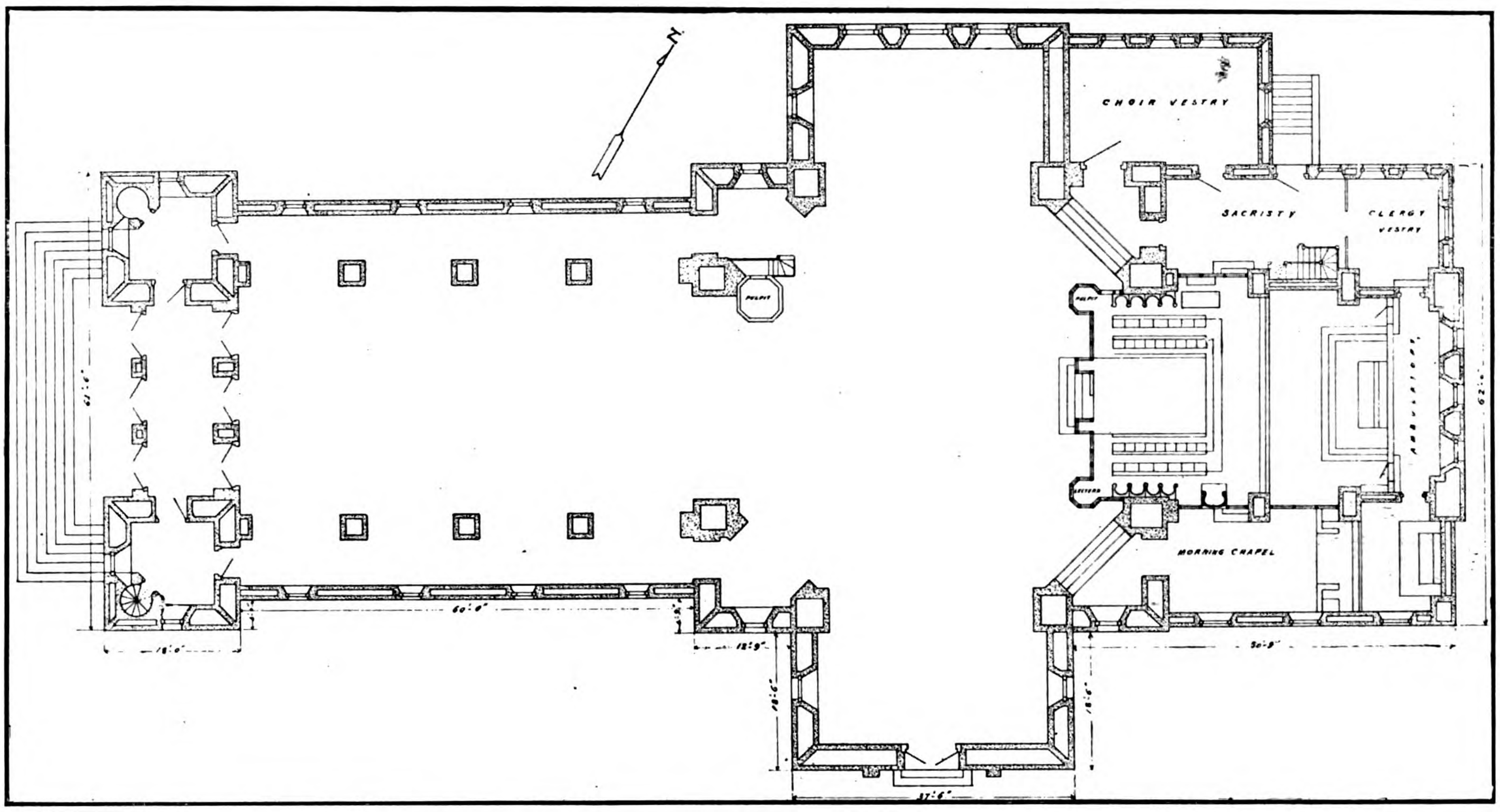
There are no pews, but deal chairs with wax finish, made according to a special design by



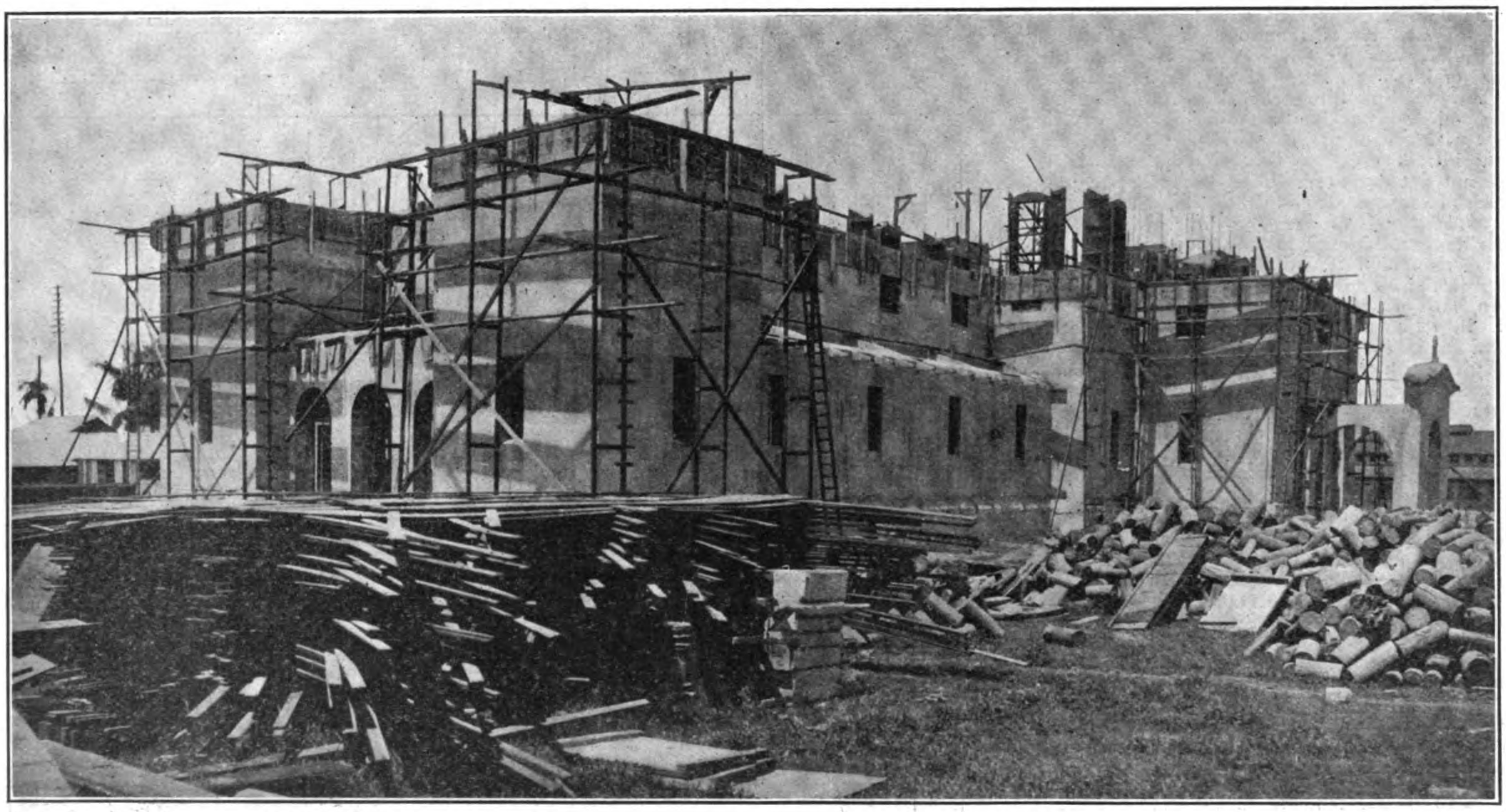
INTERIOR OF THE EDIFICE, LOOKING FROM THE NAVE THROUGH THE TRANSEPT TO THE CHANCEL



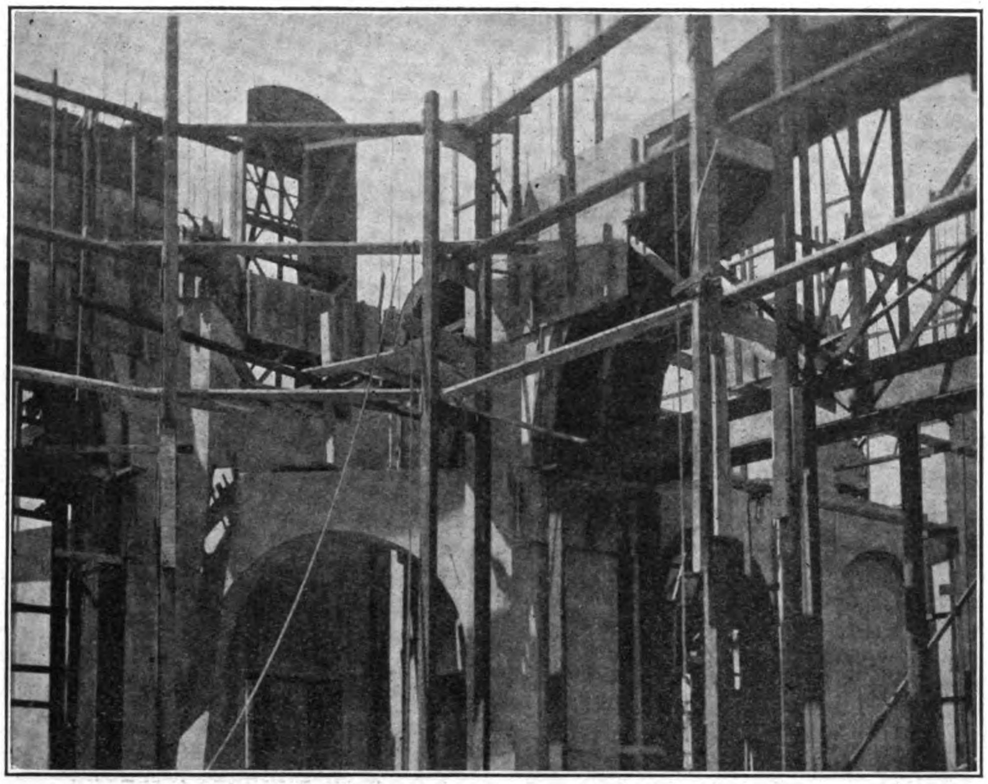
INTERIOR OF THE EDIFICE, LOOKING FROM THE CHANCEL THROUGH THE TRANSEPT AND NAVE TO THE MAIN ENTRANCE



FLOOR PLAN OF THE CHURCH, FROM ORIGINAL BY MESSRS. STURGIS & BARTON, BOSTON



GENERAL VIEW OF THE CONSTRUCTION AFTER IT WAS WELL UNDER WAY



INTERIOR OF THE EDIFICE, SHOWING ARCH CONSTRUCTION

Messrs. West & Collier, of Henley-on-Thames, England, afford the seating accommodation required.

The font, which stands at the end of the south ambulatory at the entrance of the transept, is a magnificent piece of Italian work in white marble. It was cut in Rome by Ernesto Amadeo after an ancient Byzantine model in St. Paul's Episcopal Church. The design is symbolic, representing on the respective faces of the basin the lion's head; the pelican; a griffin devouring a fish; and two birds eating a cluster of grapes. The basin is set on six columns with spiral lines, surmounted by a frieze on which a vine is cut; the whole stands on a spacious marble base. This font was the gift of St. Anne's Chapter of Domestic Missions, Church of the Heavenly Rest, New York City, in memory of its President, Olive Wilmot Sanford.

The small morning chapel to the right of the choir will contain a memorial altar of carved *akle* with ornaments, also given by a friend in America. The designs for the choir furnishings are not yet executed. These likewise are the work of Messrs. Sturgis & Barton, of Boston. A rood beam is to span the choir arch at the height of 20′ from the floor of the nave. A low screen of native wood is planned for the entrance into the choir. The pulpit and lectern, both of which are memorials, will be worked into this screen. The choir stalls are to be of Philippine hardwood and of simple design, massive, with carved figures at the end of each. The clergy sedilia are according to conventional form. The plan for the bishop's throne is elaborate and frankly gothic, with a canopy and screen. This will stand at the south side of the choir in the open arch between the morning chapel and the choir.

The altar rail is to be of native wood on brass pilasters, and is the gift of the Woman's Auxiliary of the parish. The altar itself is likewise to be of carved native wood, and is to be in memory of Major John A. Logan. Eventually there will be a reredos of the same material covering the whole extent of the concrete curtain which now separates the sanctuary from the east end of the church.

The organ, which is the gift of Mrs. J. Montgomery Sears, of Southborough, Mass., donated in memory of her husband whose purpose had been to give this in conjunction with his daughter, is to cost $10,000 gold. It is now in the hands of Messrs. J. W. Walker & Son, London, who are the builders.

It is the desire and expectation of those in charge of the property to beautify the grounds which surround the cathedral, planting them with trees and shrubs and laying out such walks as may be necessary and effective.

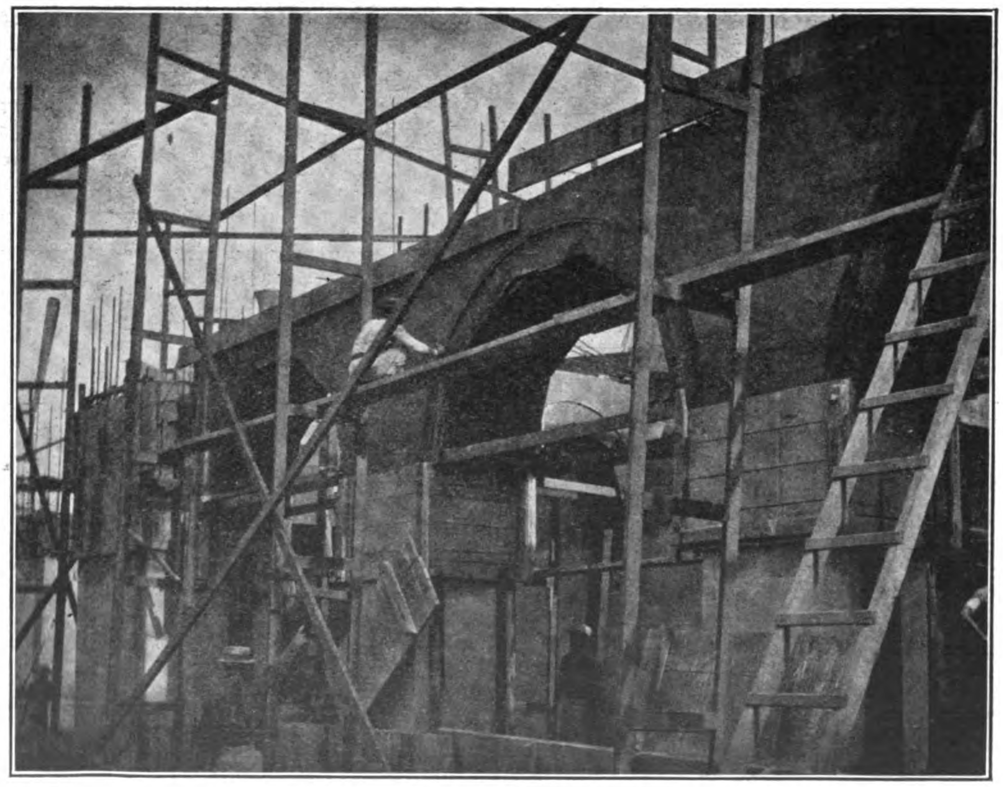
The cross which surmounts the dome was originally on the Convento de la Santissima Trinidad, Granada, Spain. It was bought by the donor of the cathedral and sent out here to be erected in place.

The towers are to hold a chime of eight bells, given by different persons and groups of persons; among them being one in memory of General Egbert, given by his family; another in memory of the officers of the Corps of Engineers, U. S. Army, who fell in the Philippines, and a third by various officers and men of different regiments in memory of fallen comrades. The bells are to be cast in Germany by Messrs. Petit & Edelbrock Bros., of Gescher, Westphalia.

DETAILS OF THE CONSTRUCTION.—About 650 piles were utilized in the foundation, being driven to a depth of from 20′ to 25′ below grade-line. They are of sound timber and none of them are less than 8″ in diameter at the small end under the bark, and not less than 12″ at the butt. Each pile was driven to solid bearing so that it was capable of sustaining safely a load of 10 tons. Piling in addition to that in the foundation proper was driven under the steps leading to the west entrance and under the altar. The piling was imbedded in solid concrete, and upon this was built 5½′ of foundation proper, having an average width of 5′. The floor itself was filled in and rammed; then there was laid 1′ of concrete, on top of which rest the tiles. The foundation is a solid wall to the water-table, and from the water-table up to the roof the walls were built on the mould system in cavity form, or 2′ to 3′ 6″ from outside to outside, the thickness of the walls being from 6″ to 8″ with the cavity between. The hollow or inner core was constructed of wood incapable of taking up moisture from the concrete and certain later on to shrink away from the enclosing concrete shell These inner forms were left in the walls. The outer forms were made more carefully and were removed from stage to stage as the work of construction progressed. All cement used below water-table was mixed in proportion of 1, 3, 6, and that for the walls 1, 2, 4, crushed rock being used throughout in the concrete.

All rods used to reinforce the concrete walls, arches, slabs, etc., are of mild steel with an elastic limit of not less than 30,000 lbs per square inch and capable of bending cold to a diameter equal to thickness of the piece tested. At all intersections of arches, columns, openings for doors and windows are concrete partitions for the purpose of interlocking the walls, the reinforcement throughout the entire building being horizontal rods ½″ in diameter and spaced 6″ on the center. They are securely tied to vertical rods by means of galvanized wire. The vertical rods are so spaced as to be placed at every intersection of a partition and around all openings for doors and windows. The vertical rods in the columns are ¾″ in diameter and are spaced 1′ on the centers. The arches are all of cavity form and the solid concrete stairway leading to the organ loft is massive and properly reinforced.

CORNER-STONE.—The corner-stone, which is a block of Mariveles granite, was laid with appropriate ceremonies on January 25th, 1905, and the first service in the complete building was held in the evening of October 28th.



ARCH CONSTRUCTION; NOTE WORKMEN IN THE ACT OF REMOVING A CONCRETE MOULD

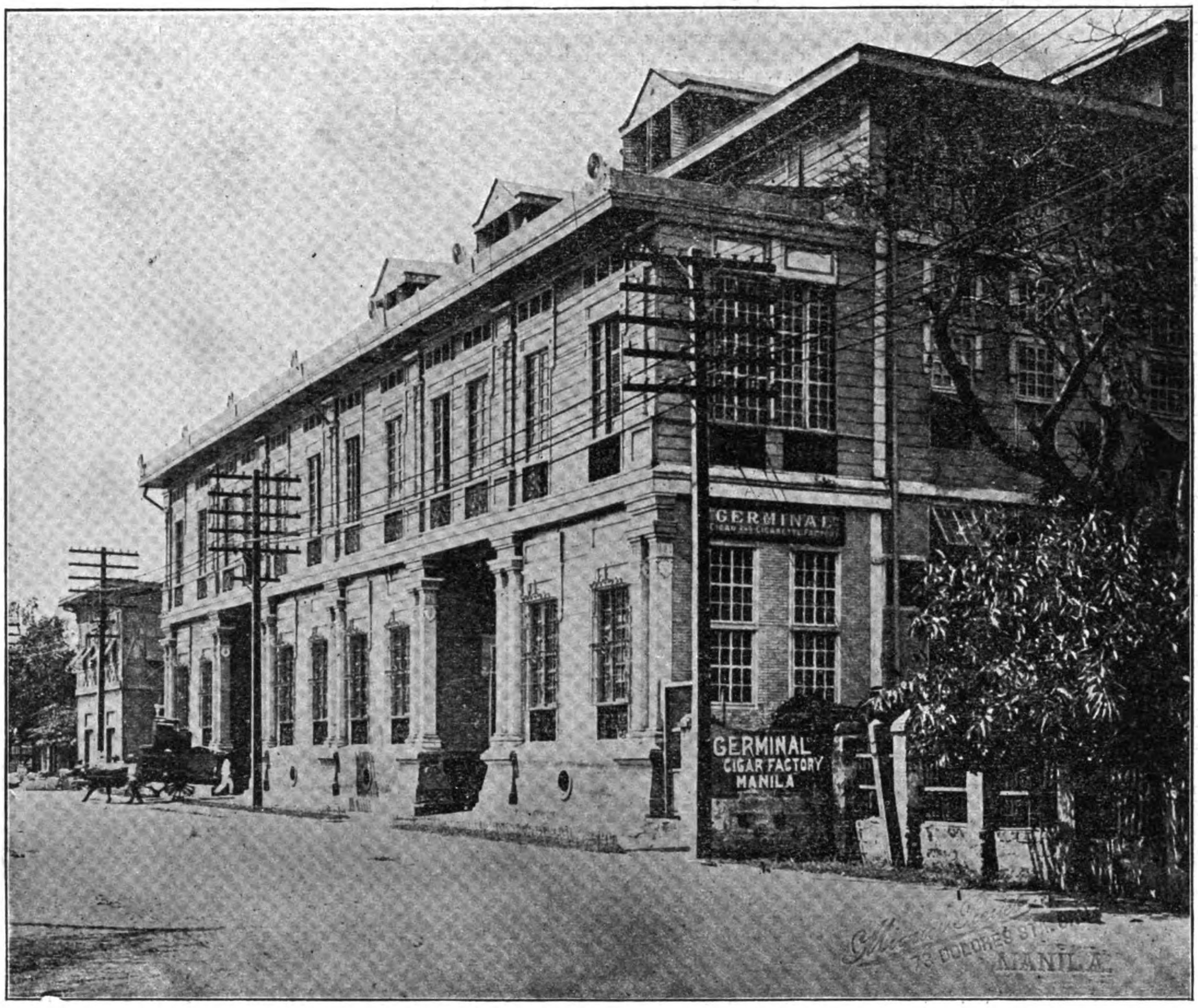
"GERMINAL" CIGAR AND CIGARETTE FACTORY, MANILA

With the close of the present year, the "Germinal" Cigar and Cigarette Factory reports a large increase in business, particularly in its export trade. The "Germinal" is a strictly Filipino company and the success of the enterprise is in a large measure due to the business ability of Dr. Ariston Bautista y Lin, President of the Board of Directors, and the progressive policy of Sr. Mauro Prieto, General Manager of the factory. These gentlemen work in harmony with the board, other prominent members of which are the Hon. T. H. Pardo de Tavera, a member of the United States Philippine Commission; V. D. Fernandez, the Hon. Gregorio Araneta, Attorney-General for the Philippine Islands, and Sr. Justo Guiedo.

The "Germinal" Cigar and Cigarette Factory, which was established in 1898, has grown steadily since its foundation and is today one of the largest and best equipped manufactories of its kind in the Philippines; it excels in every way any other establishment in this line of business in the Far East. With its numerous machines it is turning out an immense quantity of the very finest brands of cigars and cigarettes that the best selected native tobacco and skilled workmanship can produce. The demand for the "Germinal" products is so great at the present time that the factory is tried to its utmost capacity. To relieve the business of this strain and provide for future needs the Board of Directors has now under consideration large plans for the extension and enlargement of the factory. It is believed that within another year its capacity will be practically doubled.

The factory is divided into five sections. The ground floor gives accommodation to the offices and cutting appliances where the leaf is sorted, selected and properly distributed, and where the boxes for packing the finished products are manufactured. The other sections are utilized in the manufacture of the numerous grades of cigars and cigarettes that find their way into the markets of the Philippines, the European countries, China, Japan, the Straits Settlements, Australia and numerous other foreign colonial possessions in the Orient.

It requires an entire city block for the site of the "Germinal" factory, which is a 3-story building. The structure is handsome in architecture and stands at Calle Marques de Comillas and the Ayala Bridge.



"GERMINAL" CIGAR AND CIGARETTE FACTORY, MANILA

A CORRECTION

AMERICAN CHAMBER OF COMMERCE, Manila, P. I. *(Office of the Special Tariff Committee)*, November 16th, 1906.—Editor, THE FAR EASTERN REVIEW:— With reference to the circular letter of October 20th, issued by this committee, which was inserted in the last (October) number of your journal, attention is invited to an omission which has come to our notice. On the third page of the letter, following the words "twenty cents a day," the words "and subsistence" should appear. With this cost added the outlay for labor on sugar plantations will average from 20 to 40 cents gold per man per day.

In regard to the statement in the same letter that the Philippine Islands "have an area of 115,026 square miles of the richest land on the globe," we wish it understood that this statement is used in a comparative connection and must be considered in that form. No person should be so short-sighted as to infer from the statement that it is intended to convey the idea that all of this land is available for cultivation. The Philippines have their quota in large measure of mountains and a large proportion of forests, all of which is included in the total area.

We would also call attention to an error which was made in referring to the estimated expenses of the Government. The disbursements for the insular Government and the City of Manila, for the fiscal year 1904, were $14,522,597; for 1905 they were $12,800.342, while for 1906 the reports will show when published, expenditures of approximately ₱16,000,000, equal to $8,000,000 U S. currency. The error occurred in the letter in confusing pesos with dollars.

Trusting that you will give due prominence to this letter, in order that any erroneous impression may be corrected, I am,

Respectfully,

(Signed) HAROLD M. PITT,
Chairman of the Committee.

TYTAM WATERWORKS EXTENSION IN THE COLONY OF HONGKONG

At the present time the residents on the Island of Hongkong labor under several disabilities, one of the worst being the uncertainty of the rainfall; another the limited dams in which to store the water when it does descend.

For many summers it has been necessary to put the residents on short supply for a month or so until the reservoirs are augmented, but soon this practice will be entirely done away with. The Government is now building dams on the opposite side of the hill on which the City of Victoria stands, and these constructions form the subject of this illustrated sketch.

SCHEME AND ITS ENGINEERING FEATURES.—On March 16th, 1904, a scheme was undertaken to establish two necessary dams and other works below Tytam, which, it was estimated, would hold 1,400,000,000 galls. of water, drained from 2,000 acres of hills and dales.

The chief of these dams, which is to be at sea-level, and the other, some 200′ above sea-level, will both be connected by lines 18″ pipes with the present tunnel entrance at Tytam—400′ above sea-level, up to which all the water will be raised by pumping.

This is the task that is now being carried out. One large dam is nearing completion and the other will soon be begun, and to make them useful to the residents lines of pipes have to be carried over rough hills and deep gullies, a distance of 2 miles and rising 400′.

PIPE-LAYING AN ENGINEERING PROBLEM.—The laying of the pipes themselves is an engineering feat worthy of particular notice, to say nothing of the storage dams being constructed at the end of them. Great cuts have to be made in the hillsides, huge bridges have to be built over the gullies, and stout retaining walls have to be brought into requisition here and there to sustain a level. There are four bridges on the route and all are almost completed. The largest is 40′ high, with three spans of 50′; the next is 60′ high, with three spans of 20′ and one of 30′; a third is 30′ high, with two spans of 20′ and one of 30′ and a fourth bridge is somewhat smaller. All these structures are fine specimens of work. They are granite faced with concrete arches, and are built with a width of 15′, and, if anything, add to the picturesqueness of the rugged scenery encompassing them.

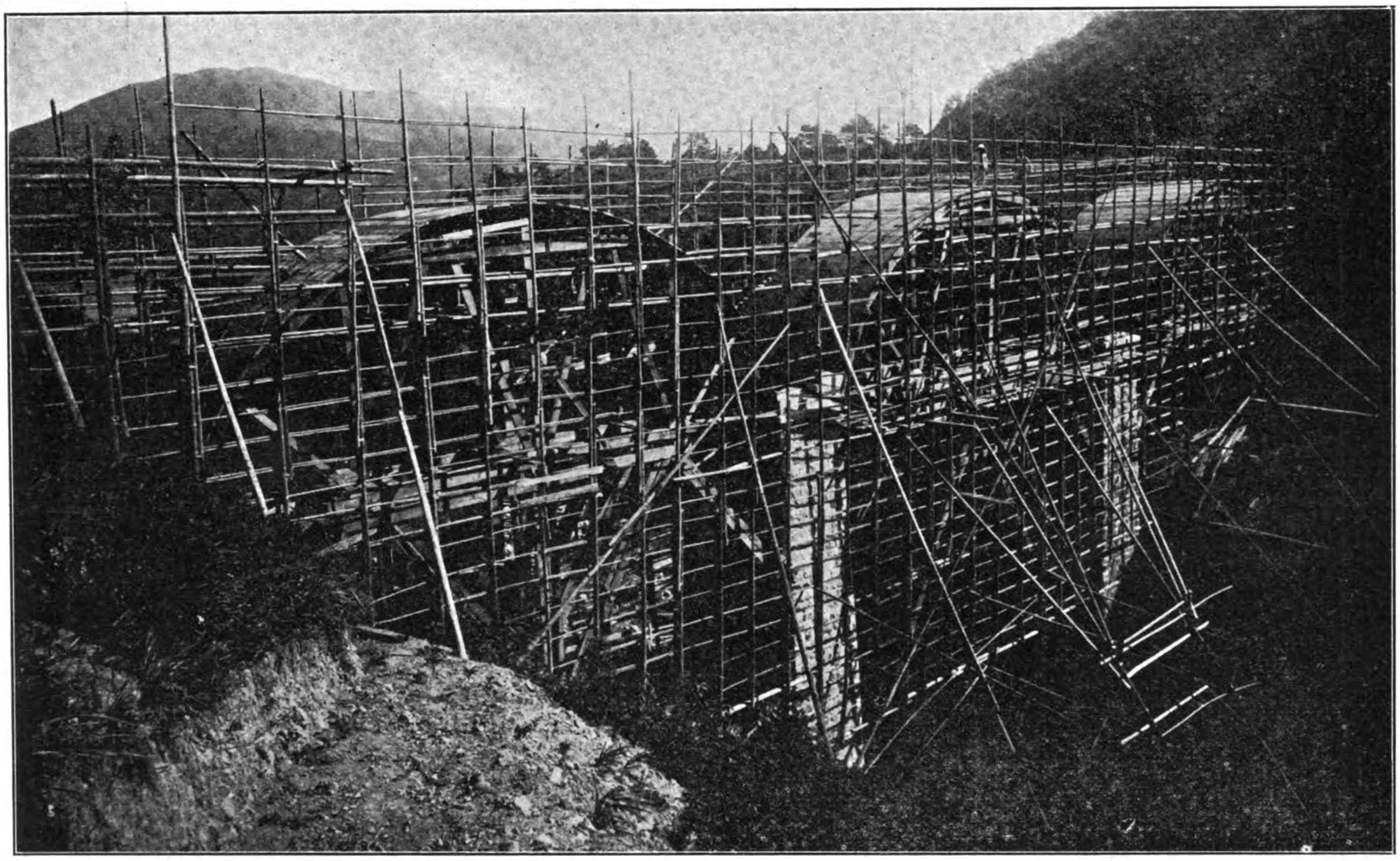
When these bridges are completed, when the cuts that clip edges off frowning hills and dip through belts of amorphous flinty shale, and anon through beds of clay, are trimmed, and when the road surface is laid over the lines of pipes that now looks snake-like as it creeps from sea to crown of hill, one of the finest roads in the colony will be open to public use. It will be 10′ wide, and will be ready to accommodate another line of mains whenever exigencies demand it. At present more than 2 miles have been laid—being placed on concrete pillars where the bed is soft—at a uniform depth of 3′ under the surface of the roadway. In this particular work every precaution has been taken to avoid any delay in the event of the necessity arising for two lines of mains, provision having been made for receiving the pipes, and all that will be necessary when the time for extension arrives will be to remove the earth and place the pipes in the bed already dug for them.

CHINAMAN AS A PIPE-LAYER.—On these works the skill of the Chinaman as a pipe-layer has been demonstrated. At the outset the Celestial could not appreciate the necessity of having a true level or a straight line. His idea was to throw the pipes together any way. Later on he saw things in a different light, came to a better understanding with the pipe, and began to lay the mains in a manner that would redound to the credit of the expert white man. He transports pipes up grades that would make the white man quake. Some 16 or 18 of him, with bamboo and rope, lift the massive main and carry it wherever it is needed. He smiles during the operation but in similar situation what would the white man do? Most likely he would sweat and fume and vituperate, and want to strike every day or so for higher wages and lesser working hours if something or other was not made to his liking. As a toiler John Chinaman needs a little pampering but not quite so much as his more enlightened and superior white brother. He is working there at Tytam in various capacities very strenuously. Whether dam-building or road-making, pipe-laying or bridge-building, engine-fitting or house-making, he shows equal capacity, capability and energy, and with the aid of 900 of him, his women and children, the vast work is progressing rapidly and is gradually absorbing the funds that Governor Sir Matthew Nathan is so carefully harboring with the object of having the scheme completed as soon as possible.

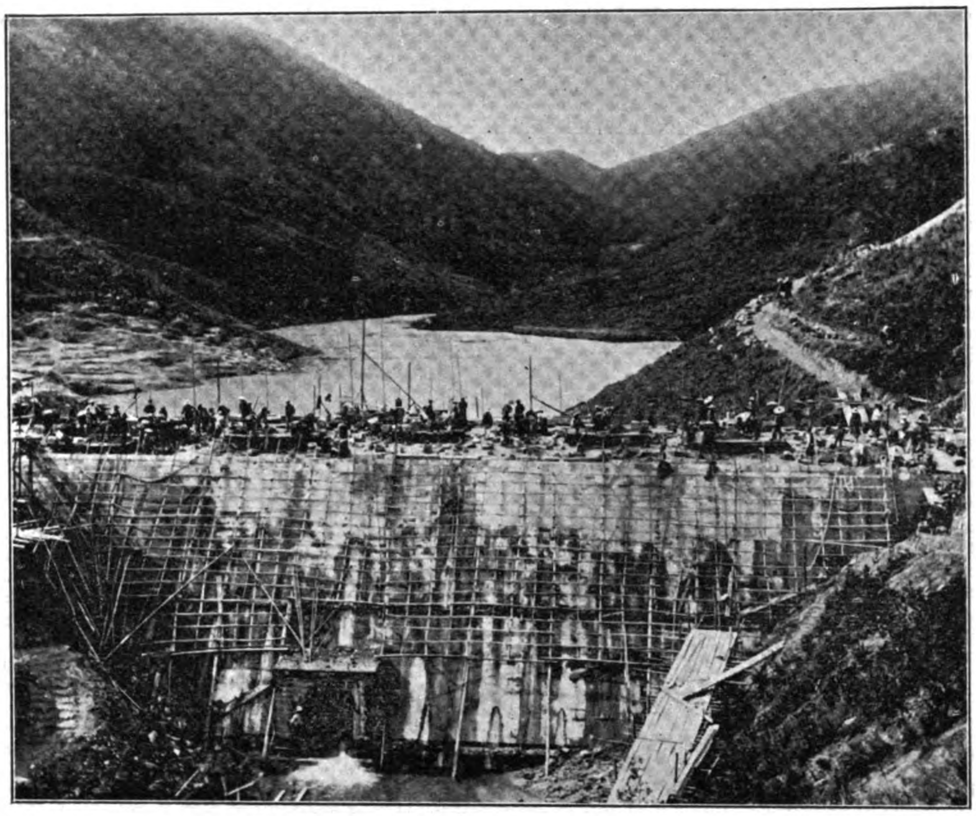
PROGRESS OF DAM CONSTRUCTION.—So far, as has been said, the pipe line is getting towards completion—at least the heaviest part of the work is done—and next come the dams. In this direction the intermediate reservoir—the one 200′ above sea-level—is almost completed. The crest of this dam will be 90′ above ground-level, and when completed will impound 200,000,000 galls. of water.

The completion of this dam and its permanent connection with Tytam will see the first of the new scheme finished, and that being made ready for use the second section will be gone on with. This consists of the construction of a huge dam at the sea-level to impound 1,200,000,000 galls. of water. The dam will cut across the head of the bay at a height of 60′ above low water, and with foundations going down to about 70′ below low water, and will uphold a vast lake.

PUMPING STATION.—The house for the pumping station has been built on the water side of Tytam Bay, and the boilers have already been installed. Workmen are now busy in preparing for the engines, and in connecting the furnaces with the chimney stack that has been erected on the hillside.



ONE OF THE BRIDGES TO CARRY PIPELINE OF TYTAM WATERWORKS EXTENSION, NOW NEARING COMPLETION



CONSTRUCTING THE INTERMEDIATE DAM AT TYTAM

There will be two separate engines, each being capable of pumping 1,250,000 galls. of water a day up the 400′ to Tytam tunnel. This is a great lift for such a quantity of water, so it can be seen that the very best engines have been procured.

In addition to the actual work on dam construction and pipe lines, there has been a vast deal done on the remote hills in the way of making catch-basins, but at present those all convey water to the original Tytam reservoir. Almost every hill in sight has been seared by drains, some of them passing along hills, uncommon steepness.

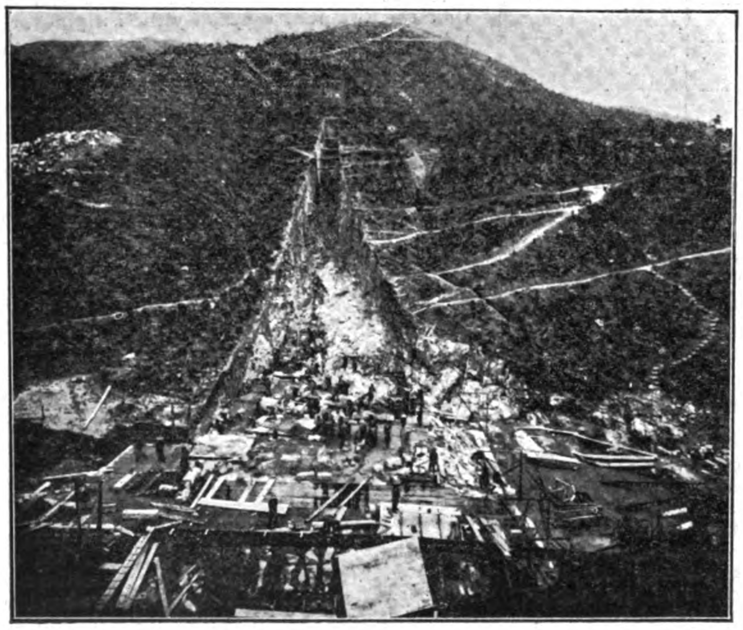
MAGNITUDE OF THE WORK.—The magnitude of this work near Tytam can not be gauged without a personal inspection of the improvement. The Government is spending a vast sum of money on the scheme, and the work is being carried out in a manner that reflects high credit upon the Public Works Department, of which Mr. W. Chatham is the head. Mr. D. Jaffé, of the department, is in immediate charge, and what is done by him shows thoroughness as to detail.

It is necessary, in order to make it clear to the reader how the new scheme is to fit in with the existing one, to traverse some old ground. At present the colony is being supplied with water from four reservoirs. The oldest one is at Pokfulum, which holds 66,000,000 galls. of water; the next to be built was at Tytam to hold 312,000,000 galls., and which was completed in 1889. Later an extension was made to this reservoir, resulting in the impounding of a total of 804,000,000 galls., the water being conveyed by a tunnel 1¾ miles long to Bowen-rd, and thence to the filter beds near the Peak tramline. The water flows through the tunnel by gravitation, and it is into this tunnel that all the water from the reservoirs now being built at Tytam-tuk will be pumped, so that it will eventually find its way to the Bowen-rd filter beds, which are being enlarged to meet the great pressure that is likely to be placed upon them. Other dams that contribute to the public demand are the Wongneichong dam, completed in 1900, which holds 33,000,000 galls., and the Tytam bywash, completed in 1904, which holds 20,000,000 galls. These fail to meet the present average consumption of about 5,000,000 galls. a day, and so it has sometimes been necessary to enforce an intermittent service; but it is hoped that the increased supply being rendered available and the application of the Rider main system—recently introduced—will obviate the necessity of cutting off the supply from European houses in the future. The Rider mains apply solely to Chinese houses, and allow a full supply of water in case of fire, and an uninterrupted service to white dwellers on the islands.

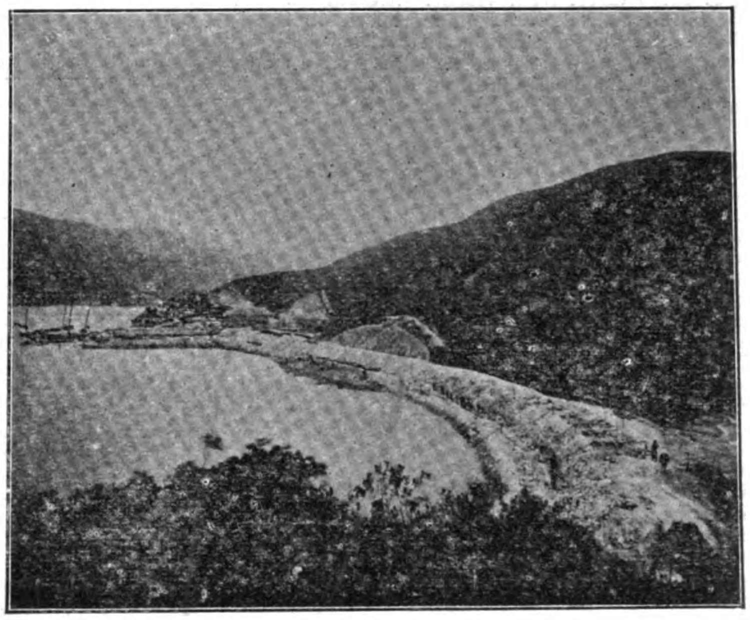
REINFORCED CONCRETE

Major-General Leonard Wood, commanding the Philippines Division, has recommended to the War Department at Washington that all military post quarters, barracks, and other buildings in connection thereto, be constructed of reinforced concrete, experience having shown that this is the best material for protection against earthquakes, fires, heavy storms of every description, and the ravages of tropical insects with particular reference to the destructive white ant. While the construction of these buildings, if systematically carried out, will cost at first considerably more than the present structures, General Wood holds that at the end of five years the cost will not exceed that of the temporary buildings plus the many repairs that are required for the present style of quarters and barracks. At the end of 10 years will have required practically reconstruction and will be in the last stages of usefulness, while the proposed concrete buildings would last an indefinite period. Much money would have been saved, in the opinion of General Wood, had the buildings at Fort William McKinley been constructed of reinforced concrete inasmuch as the repairs already called for as the result of the storms of one season have reached in the neighborhood of $75,000 gold.

"It is safe to say," General Wood remarks, "that within 10 years we shall have spent as much on this post as the buildings originally cost, and will have old buildings, frequently repaired, which will be entirely unsatisfactory. We should recognize climatic conditions, and adopt a type of construction designed to resist them. There is no economy in our present procedure; in fact, it is an extremely expensive one."



LAYING THE PIPELINE THROUGH A HILL AT TYTAM, WHERE TUNNELING IS NECESSARY



SITE OF PUMPING STATION ON TYTAM BAY; HEAD OF THIS BAY IS BEING DAMMED

PUBLIC IMPROVEMENTS IN KOREA

The Korean Government has arranged with the Industrial Bank of Japan for a loan of -Y-10,000,000 with which to construct important public works, which include waterworks at Chemulpo, and roads between Chinnampo and Wonsan through Pyong-yang, Tai-koo and Yang-il Bay through Kyong-gye, Chon-gye and Kunsan, and Mok-pho and Kang-gyu.

A reclamation from the sea adjacent to the present customs compound at Chemulpo will be made, upon which much-needed warehouses, etc., will be constructed. The area of this proposed first extension will be about 42,300 square meters. One or more piers will be constructed, each at least 300′ long, so as to project into the harbor from the newly reclaimed area, in such a way that cargo may be loaded and unloaded at any state of the tide. Both sides of these piers and the side of the ground facing the harbor will be used as landing places from cargo boats. This side and one pier will have a total length of 1,050′ as accommodation for mooring cargo, and they will be fitted up with cranes for the easy handling of heavy goods. The south side of the reclaimed ground, 780′ long, will be bounded by a retaining wall of lighter construction. After this work has been accomplished, the customs offices, bonded warehouses, sheds, etc., will be built.

The position of the present custom house at Fusan is inconveniently situated for further extension in any direction, because not only three of its sides are bounded by the city streets and the fourth faces the sea, but also it is hardly accessible by the railway. Consequently it is intended to reclaim ground, 20,000 square metres in area, in front of the newly reclaimed ground of the Yeizen Hill Reclamation Company as a site for the custom house, and to construct a pier from the southeastern extremity of this reclamation, thus forming a sheltered harbor between the pier and the town of Fusan. The northern side of this pier will be a stone wall serviceable as a breakwater, and on its southern side an iron quay will be constructed alongside the pier so as to afford accommodation for the mooring of vessels and to support cranes for the easy handling of cargo. The reclaimed ground facing this inner harbor is intended to be allotted as a landing place from cargo-boats; and when the work of reclamation and the construction of the pier is completed, the customs offices, bonded warehouses, sheds, inspector's department, and passengers' baggage examination office will be built, railway laid and road opened so as to give direct communication with the Seoul-Fusan Railway on the one side and the town of Fusan on the other. At present the port of Fusan has no accommodation for the mooring of vessels as well as for the loading and unloading of cargo direct from vessels. Although a company has a pier at present under construction it lacks railway connection and free transportation of goods is hardly to be expected. In discharging and landing cargo from vessels lying at anchor in the present harbor, not only is the taking of cargo into lighters and carrying of it to the present customs compound highly inconvenient, but also actual stoppage of loading and unloading frequently occurs during a northeast wind. On land too, there is scarcely sufficient accommodation for the handling of cargo. It is therefore intended to build a pier extending over 840′ from one extremity of the aforementioned reclaimed ground, of which the side facing the inner harbor so formed shall be constructed in the form of an iron quay affording ample accommodation for two vessels, drawing nearly 20′, lying alongside at the same time, to connect it with the railway to facilitate the conveyance and distribution of passengers and cargo. The present custom house at Fusan is about 10,000 square metres in extent, with a water basin in front. This water basin will be kept as it is for the berthing of coasting vessels, and in addition part of it will be allotted as the landing place for marine products and this part fitted up with certain appliances necessary to the fishing industry. The above work will be commenced early in 1906.

Along with the reconstruction of the customs the building of light houses, beacons and buoys at several important places for the aid of shipping along the Korean Coast, where the shipping business is expected to be busily engaged in the near future, is being undertaken in proportion to the advance of Korea's foreign trade. The following designs are to be completed within this year:—Wonsan Harbor light on Chotoku Island, ½ mile in the northeast direction from the Japanese Settlement in Wonsan, Wonsan buoy, Nicholski Island light, Cape Duroch light, Deer Island light, Fusan leading lights, Baker Island light, Kunsan beacon and Kunsan buoy. All of them are of new establishment, except the Fusan leading lights which are to be reconstructed. In and after next year the following are expected to be made:—Bamboo Island light, Little Green Island light, Sei Tau light, (237) Island light, Observation Island Gas Works, Yalu gas buoy, Yalu unlighted buoy, Shopaiul Island light, (133) Island light, Pic Sen Island light, Are Chu Ra Tau Island light, Choppeki Point Island light, Won Do light, Port Gate light, South Island light, Cape Clonard light, Chiku Pion Point light, Lagovitchenski, Point light, 1 Bari Tau light, West Clifford Island light, Overfalls light, Five Island light, Nine Pin Rock light, Long Island light, Cliff Island light, Stanley Island light, Sentinel Island light, Brine Point Island light, Cape Nadejda light and Bruat light.

ASSEMBLY OF DISTRICT ENGINEERS

During the current month the district engineers of the Philippine Government have been holding a convention in Manila for the purpose of exchanging views upon their work and official duties. This assembly is proving most helpful and instructive and has developed a number of most interesting papers covering engineering practice in the tropics, the best of which will appear in subsequent issues of THE REVIEW. Following is a list of the engineers who have been in attendance:—

District Engineer.	*Headquarters*	*Provinces.*
R. A. Blair	Tuguegarao	Cagayan. Isabela.
E. P. Shuman	Vigan	Ilocos Norte. Ilocos Sur.
E. S. Wheeler.	Dagupan	Union. Pangasinan.
E. C. Phipps (acting)	San Fernando.	Pampanga. Tarlac.
R. C. Hardman	Malolos	Bulacan. Nueva Ecija.
E. J. Westerhouse	Pasig	Rizal. Laguna. Cavite.
J. S. Nichol (acting)	Lucena	Batangas. Tayabas.
H. C. Humphrey	Albay	Amb. Camarines. Albay. Sorsogon.
E. O. Worrick	Tacloban	Samar. Leyte.
O. D. Filley	Iloilo	Capiz. Antique. Iloilo. Neg. Occidental
T. W. Allen	Cebu	Bohol. Cebu. Negros Oriental.
B. H. Burrell	Surigao	Surigao. Misamis.

Papers on maintenance, road construction, the construction, repair and maintenance of bridges and culverts, surveys and buildings, were read and discussed.

MANILA FIRE DEPARTMENT

During the fiscal year ended June 30th, 1906, the department responded to 124 alarms, which is a decrease of seven for the corresponding period of 1905. All alarms, with the exception of one or two, were received with promptness over the fire-alarm system, which was kept in perfect working order by the City Electrician's force, and the quick response and efficient work of the department reduced the losses to a minimum. A comparison of the losses for the past four years shows a steady reduction, the credit of which must be largely attributed to the increased efficiency and better equipment of the department. The following table is self-explanatory:—

Losses for—

1903	₱1,670.650
1904	468,911
1905	135,921
1906	76,192.90

The losses for 1906 are divided as follows:—

Buildings	₱50,175.50
Contents	26,017.40

The total insurance on property affected by fire during the fiscal year 1906, according to the records of the Fire Department, amounted to -P-692,237 on buildings and ₱853,620 on contents.

The total value of all buildings in the city subject to taxation according to the records of the city assessor and collector is ₱35,101,983. The approximate value of all buildings erected during the last fiscal year, plus repairs on old buildings, is ₱2,600,000, which therefore represents the approximate increase in the value of improvements subject to taxation, disregarding the element of one year of deterioration of all old buildings. The total loss due to fire on buildings during the same period was ₱50,175.50, or approximately one-seventh of 1 per cent. According to the annual report of the fiscal year 1905, the damage from fire was slightly less than one-fifth of 1 per cent.

Act No. 1421 appropriated for the fiscal year for—

Salaries and wages	₱237,000.00
Contingent expenses	60,450.00
Total	297,450.00

The expenditures were as follows:

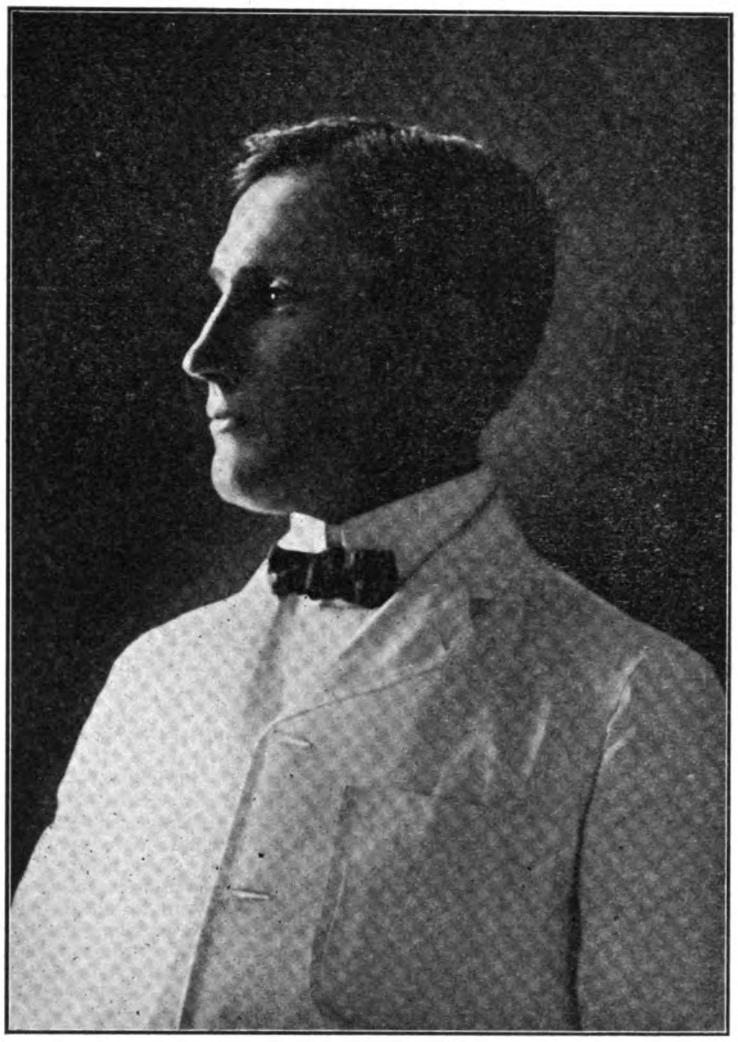
Salaries and wages	₱238,739.74
Contingent expenses	56,069.89
Total	294,809.63

The above statement shows a decrease in expenditures of ₱22,757.54 over the previous year. This favorable reduction in the cost of operation and maintenance of the department has been accomplished without any loss in efficiency and is largely due to the elimination of nonrecurring expenses chiefly in the purchase of equipment and in the extension of the fire and police alarm systems.

It has been noted with much satisfaction that the firemen, especially the Filipinos, are taking more pride in their personal appearance, says chief Dingman in his annual report. There has been an increase in the number of requests received from probational members to wear the uniform, which is a privilege only credited to those who can obtain the recommendation of their commanding officers. A better class of men of both grades is seeking employment, and there has been no difficulty in securing good men to fill vacancies. The Filipino firemen in particular render uninterrupted service and they value their position very highly. The constant training under experienced American officers is entirely satisfactory and many 2d-class firemen are exceedingly efficient, and when operating under the direction of officers they perform their duties in a way which promises well for the future. The 2d class men have learned to use their heads and to study the methods of attacking a fire, and those who have had two or three years' experience are less liable to confusion or to expose themselves to unnecessary danger, or to lose time in useless activity. All the men who resigned had better positions in view, and several of the 1st-class men have returned to the United States for the purpose of going into business. Wherever possible these vacancies have been filled by promotions from the 2d-class.

PHILIPPINE ISLANDS PROMOTION MOVEMENT

When Mr. George Bronson Rea, publisher of THE FAR EASTERN REVIEW, was in Washington last winter in the interest of favorable tariff legislation for the Philippine Islands, he was forcibly impressed, among other things, with the almost general ignorance and lack of interest displayed by the people regarding this country. Like other Manilans who were working with Congress to induce it to give the Islands that relief their people, trade and industry deserve, and are entitled to, he saw that among the many important steps necessary to accomplish something for the Philippines was systematic and persistent missionary work in financial and commercial circles,



GEORGE BRONSON REA, M. E.,
WHO WILL PROMOTE PHILIPPINE INTERESTS IN AMERICA, WITH HEADQUARTERS AT NEW YORK CITY.

and among the masses of the people. Immediately after concluding his work in Washington he set about to evolve a plan of promotion by way of a publicity campaign in the United States, to the end that the Philippines would be presented in a favorable light before the American people, the merchants educated up to a better idea of the possibilities of the Islands, and the manufacturers and capitalists informed of the opportunities for trade and the development of the latent resources of these possessions. Mr. Rea is now en route to New York City, where he will, about the first of the new year, start his promotion campaign. He will open an office there for THE FAR EASTERN REVIEW and also establish in the heart of the financial district of New York a general information bureau for the Philippine Islands. This bureau will be fitted out with a complete library of all official publications pertaining to the Philippine Islands, of local newspapers, of extra copies of department pamphlets describing the hemp, maguey, sugar, mining and other industries offering large fields for investors; copies of the principal laws of the Islands regarding commerce and industry such as the corporation law, the land law and those relating to mining, forestry, shipping, etc., indispensable to the preliminary investigations of capitalists; of department maps, surveys and plans, and specimens of leading Philippine woods, minerals, agricultural products, etc. A press service and press-clipping service will also be one of the important features of the missionary work. In fact, it is Mr. Rea's intention to keep before the American people through every possible channel of publicity the true facts about the Philippines and their future trade and industrial possibilities. Before definitely deciding to take up this work, Mr. Rea presented his plan in detail to the Governor-General and the members of the Philippine Commission for their consideration. After looking into the matter quite thoroughly the heads of the central Government decided to give Mr. Rea their unqualified support in the way of supplying him with official material, etc., to enable him to organize his promotion bureau, and affairs have been so arranged at this end that immediately upon his arrival in New York Mr. Rea will be prepared to begin his propaganda. He will not only work in harmony with the Government but also with the chambers of commerce of Manila, and it is believed that with his past experience along these lines and his large and accurate knowledge of Philippine needs and resources he will be able to accomplish much for the future of the Islands. Mr. Rea's services will be given to the cause of the Philippines without expectation of monetary remuneration. All that he asks and expects is the earnest coöperation here of those interested in the work he will seek to accomplish in the homeland.

ORIENTAL TRADE DECLINE

New York and London daily newspapers have recently been discussing the alleged decline of American trade in the Far East, pointing out that exports to China, Japan and Hongkong fell from $78,321,979 gold during the first seven months of 1905 to $42,484,388 in the first seven months in 1906. Also that shipments to China dropped from $37,181,220 to $20,612,191, and shipments to Japan from $36,800,468 to $18,774,726.

The fact is entirely overlooked that abnormal trade conditions existed in the Far East in 1905. The cessation of the Russia-Japan War caused an influx of imported merchandise from both Europe and America too great for the consumption of the people This excess overstocked the markets for 1905, and the natural result was the checking of imports, China and Japan buying less this year from other countries. The total amount of Japanese imports for the first six months of 1906 was $108,534,191 gold, a decline of $30,873,319 from the first six months of 1905.

That Japan's reduced purchases did not affect America alone is evident from British official figures. These do not yet show total exports to various countries, but exports are shown by commodities. In iron and steel manufactures Great Britain made new high-record strides in exports this year, yet her sale of these goods to Japan in the following lines (all that are detailed) fell off, the figures being for the first seven months of the respective months:—

	1905	1906
Pig iron	$565,750	$364,885
Iron forgings	247,977	98,403
Wrought iron	64,072	31,849
Iron plates	113,409	107,442
Galvanized sheets	1,044,775	784,435
Bars and angles	690,644	639,817

In these items alone Great Britain's sales to Japan decreased by about $700,000 gold for the first seven months of this year over those of the 1905 period.

The heavy end of China's purchases is in cotton goods, and Great Britain simply shared America's lot in reduced trade therein. The shipments of all classes of British piece goods to China and Hongkong from January 1st to August 1st, 1906, totaled $24,796,863 gold, a decrease of $2,905,962 from the same period in 1905. The American loss was somewhat greater, being $5,533,083 gold, the sales amounting this year up to August 1st to $13,673,223.

With a boycott to contend with the showing is not so bad, especially considering that for the first seven months of 1904 the cotton cloth sales of the United States to the Chinese Empire and Hongkong amounted to only $3,667,968 gold, when those of Great Britain totaled $18,286,020. Thus the cotton goods sales of the two countries in China stood about 1 to 6 in favor of Great Britain in the 1904 period and 1 to less than 2 in the 1906 period.

ELECTRIC RAILWAY EXTENSION, MANILA

Messrs. J. G. White & Co., Inc., are rushing the construction of the extension of the system of the Manila Electric Railroad and Light Company to Fort McKinley, Province of Rizal, to completion. Six large construction cars were received recently to facilitate the work. They are extra-heavy, double-truck cars with larger wheels than ordinary, and are about 37′ in length. When construction work is finished these cars will be turned over to the railway company who will convert them into freight carriers for use between Manila and the military reservation. On account of the rainy weather the work of grading the new extension has been slow, but the contractors now have a large force of laborers employed and track-laying has begun. It is believed that the new line will be turned over to the railway company shortly after the first of the new year.

COMPREHENSIVE REVIEW OF THE MALAYSIA TIN-MINING INDUSTRY

(*Written specially for the "Straits Times" by Mr. Ralph Stokes.*)

The unprecedented rise and fluctuations in the price of tin have drawn unusual attention to the question of the future supply of this ill-distributed metal; and, although keen public interest has been awakened in the matter, largely with the hope of drawing new lifeblood into the financial veins of certain languishing fields, it has always been allowed that Malaya must long hold the key of the position. In view of this country's 62½ per cent contribution to the world's aggregate, such a recognition of its influence involves no extraordinary perception nor generosity of mind. But the greater part of the commentaries on the tin position published in the home non-technical press has comprised but truisms and platitudes, followed by very questionable or extravagant generalizations as to effect of the rise on various mining fields of lesser import. The influence of the advance in valuation of the metal has not been strikingly manifest in Malaya. For indeed, as it is scarcely necessary to reiterate, the standardization of the dollar has led to an augmentation of operating costs all round, not excluding those companies largely dependent on imported machinery and coal. It is of interest to regard the matter in this light, justifiably assuming that it costs as many dollars to do a given piece of work, whether the exchange is 1*s* 9*d* or 2*s* 4*d*. During 1902-4, the average price of tin was $80 a picul; to-day it stands in the vicinity of $88—a rise of only 10 per cent. Yet, on the sterling basis, the rise is nearer 40 per cent for the period.

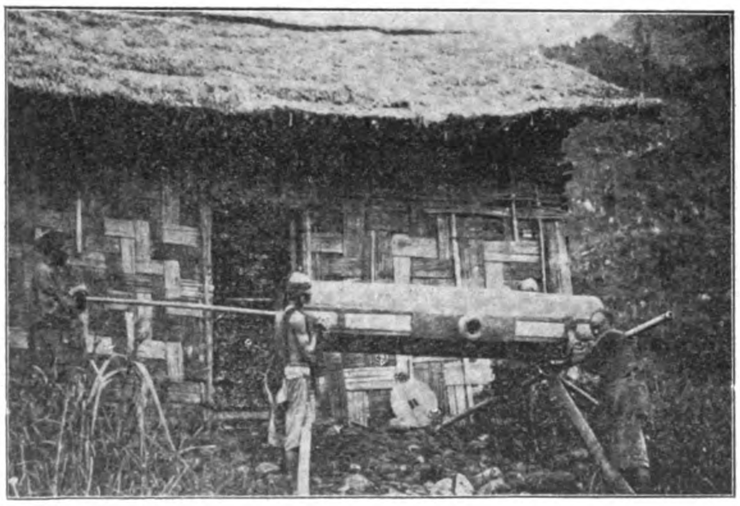
Excellent Suggestion.—Other dominant factors in the present position are the slow exhaustion of the richer surface deposits, worked by the Chinese, and the steady increase in the percentage of tin produced by the European-controlled venture. It is to be regretted, having regard to the manifest ignorance prevailing in the outside world of Malay conditions and to the similarly manifest need for the introduction of more capital, that the Mines Department in conjunction with Mr. J. B. Scrivenor, Government Geologist, does not issue more readable annual reports, upon the course of events and the work of the principal mines. A systematically compiled review of this description, running to 50 or 100 pages and illustrated (I only suggest what is done as a matter of course in other colonies), would without doubt be highly advantageous to the interests of the States. Apparently, however, the department has its time too fully absorbed with legal questions and disputes as to water-rights, mining leases and the disposal of ubiquitous tailings.

In some respects, however, it may be said that the neglect of the Malay tin-field by financial men has been a blessing, for now that the time has surely come for the mining engineer with capital behind him to extend his control, the financial atmosphere is comparatively pure. Compared with other mining fields of like magnitude, Malaya may certainly be said to have a good financial record. Honest failures can be nowhere entirely avoided. But in nearly all cases, it is to be seen that the basis of capitalization adopted has been reasonable. The fact that the capitals of 13 leading producers in Perak, Selangor, and Negri Sembilan total £840,000, demonstrates this absence of excessive capitalization Occasionally, the fault of providing insufficient working capital is committed. Perhaps, the Kledang company floated in Cornwall two months ago, with a capital of £100,000, has fallen into this error. For the initial expenditure must be heavy, and only £20,000 working capital, with 5,000 reserve £1 shares, has been allowed.

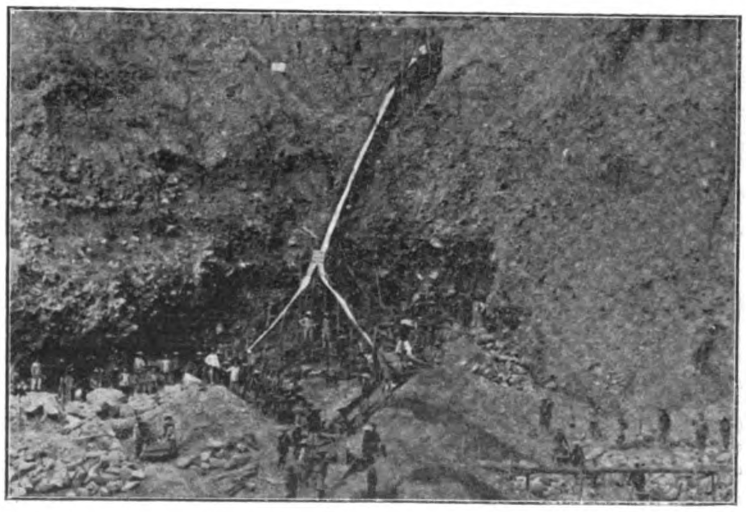
Duty Question.—The Government is occasionally censured for failing to encourage the capitalist, or, rather, for actually discouraging him by keeping the present undiscriminating schedule of taxation in force. Concessions should be allowed, it is claimed, to the company spending large sums on plant and development; the duty payable by such concerns should be less than that for the surface working, equipped, may be, with only an endless chain pump, and a land shoot or two. The Government position is clearly a difficult one. To suggest that it would wittingly act contrary to the general interests of the mining industry and country is absurd. It must, moreover, be borne in mind that adequate allowance is already made to those ventures requiring to blast and crush their tin-bearing ground. The *lode* definition was recently cancelled for one simply of hardness, to be determined by the Senior Warden of Mines and the Government Geologist. Thus a body of calcite-cemented ore, as at the French company's Lahat mine, receives the maximum 50 per cent concession, whilst a true lode deposit, greatly decomposed, may receive much less. This is just enough, but does not apparently satisfy the demands of those who wish to see allowances made in respect of capital expenditure on plant. Were such made, it is to be feared that the towkay mine-owners would consider their conservatism inequitably penalized and would protest vehemently, claiming that they are

FAMILIES OF ANNAMESE TIN-MINERS IN MALAYA

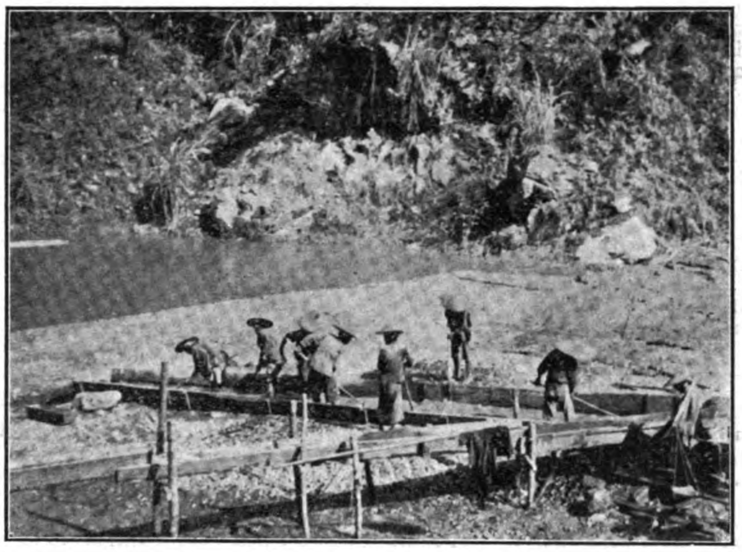
SURFACE MINING IS PROFITABLE AND PRODUCTIVE



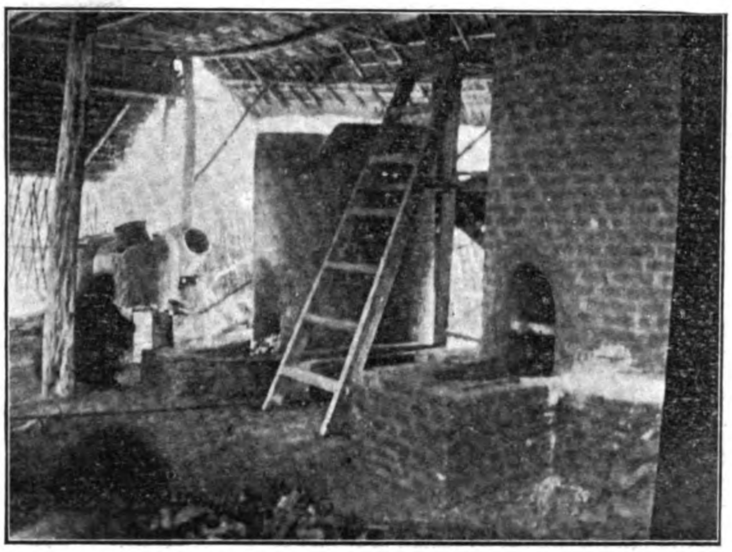
BELLOWS USED AT A SMELTER



GRAVITY SLUICE FOR WASHING ORE



WASHING ORE AT FOOT OF A GRAVITY SLUICE



BRICK KILN FOR SMELTING ORE

paying out twice or three times as much in wages per picul produced as their favored neighbor with steam navy and blondin conveyor. The whole question of taxation is one calling for the most delicate handling, especially in fields where no system of profit assessment is practicable and wherever the duty is high, as in Malaya, the Government policy must necessarily meet with disapprobation. Whether the finances of the States are not sufficiently sound to permit of a general reduction is another matter, worthy of independent discussion. If the present high rate is only prompted by fears of a speedy exhaustion of the tin, then certainly such a happy decrease would be advantageous and politic. But the official mind is of inscrutable, though rarely as irrational as the uninformed critic would proclaim.

In one way, at least, it must be acknowledged that the Government has lately been working justly in the capitalist's favor, at the expense of the Chinese leaseholder. In Perak particularly—where the policy is of greatest importance—the Resident has been strictly enforcing the labor clause of agreements. Mr. Birch has declared himself anxious to see the ground either worked or abandoned. Thus, many leaseholders—who might have held out indefinitely for some exorbitant price—have been recently endeavoring to dispose of their ground, perhaps low grade or deep level to those with the capital and knowledge to turn it to account.

ULTRA PROSPEROUS COOLIE.—There have been whisperings recently, now that survey plans and records have been brought into reasonable order, of the Lands Department throwing open the long-closed application books for Perak. It is very doubtful if any good purpose could be served by the alienation of further tracts of mining ground. Chinese immigration is now more or less at a standstill and as elsewhere in the peninsula, labor is signally independent. With the gradual exhaustion of the surface deposits and the installation of labor-saving devices, there is some hope of the position righting itself, from the employer's point of view. But the opening of new ground would only tend to provide further demands for the services of the ultra-prosperous coolie, new temptations to the deserter. Moreover, is it not to the very distinct advantage of the country that the old ground be thoroughly exhausted before its abandonment for "pastures new"?

NATURAL FEATURES.—It is only necessary here to give, for the sake of completeness, the roughest outline of geological conditions. There are yet many problems associated with Malay geology calling for solution, but they are secondary rather than primary perplexities. The broad features of the tin-fields are well-known—the great axial range of granite mountains, running north and south, with schists and gueisses along its marginal contact, and the upturned limestones, standing as precipitous jungle-covered hills to heights of 1,000′ and 2,000′. In the plains along the western edges of the granite, the best alluvial tin occurs. In many places, so many, in fact, as to suggest a principal source of origin, the tin has been traced to the lowlying hills of schist and pegmatite ranging along the margin of the granite. Meru, Bruseh, Jeher, Sipiau and Sudu Seremban may be cited in this context. Yet unmistakable tin-lodes, as the Government Geologist has proved beyond question, are also found in the limestone.

It is unfortunate that the Government Service does not include a larger Geological Survey, for there is yet much information to be collected concerning the nature of Malay tin deposits, of great industrial import. The task is clearly beyond the capabilities of any one man however skilful and energetic he may be. Nevertheless, Mr. Scrivenor has succeeded in performing a great deal of good work since his first engagement by the Government and a comprehensive report, to be prepared by him at the close of this year, will be a particularly valuable record of three years' labors. That Mr. Scrivenor's attention should have been principally concentrated upon lesser known Pahang was to be expected, but the more remarkable features of the western States have not been neglected and the anticipated review should be satisfactorily far-reaching in its sphere. Yet the fact should not be lost sight of that the ultimate aim of every Geological Survey must be a geological map,—a compilation of inestimable value to any country.

It may be approximately estimated that from 85 to 90 per cent of Malay tin is contributed by the Chinese. Despite their preponderating importance, the Chinese workings and methods will not be discussed in this article, purporting to deal exclusively with the present situation. And Chinese mining has been the same for decades past. There are two famous Chinese mines, Tambun and Kamunting, typifying the advanced and conservatively backward classes, whose position may be pertinently noted.

TAMBUN.—The Tambun, once the world's greatest tin-producer, whose 1903 yield of 2,417 tons of metal was equivalent to half the production of all Australasia or Cornwall, is owned by Mr. Liong Fe, M. C. It may be recalled that an Englishman of high standing in the mining world was once part owner of the ground (which was being held for coffee planting) and sold his share for the proverbial song, all unsuspecting the enormous wealth of the property. The Karong or tin-bearing deposit occurs at a depth averaging 40-50′ and has been in the past entirely worked on the Chinese shafting system, on particularly daring principles. An examination of the surface to-day and of the great subsidence over the old workings, marks how the gradual fall of the ground was profited by underground of the miners, who allowed their props to sink into the footwall whilst they kept pace with the subsidence. The value of the ground extracted cannot be exactly determined. During 1902-3, it averaged 26 katis per yard. Although the best days of the mine are surely past, there is still a considerable life ahead of the deposit. Shafting has now been stopped and the proposition is being transformed into a large opencaste. While this is proceeding, outputs will be nominal. There will be a large quantity of low grade ground made available for profitable treatment under the altered conditions and for this a new horizontal puddler and 300′ of sluicing are being installed. For a Chinese mine, Tambun has always been remarkably well equipped, Mr. Liong Fe having discreetly placed his property in the hands of competent engineers. The plant comprises four 20′ puddlers, from which the concentrates are run to a belt elevator, raising them above the trommels and jigs. Any rock fragments too large for the first trommel are passed to a jaw rockbreaker, Huntingdon Mill and Wilfey table. Altogether, an undoubtedly good extraction is obtained.

KAMUNTING.—Kamunting, the largest opencaste mine in the country and strangely situated in the languishing district of Taiping, presents a peculiar contrast to Tambun. It is held privately by Mr. Ng Boo Bee, whose ideas are conservative in the extreme. The output maintained is 1,500 piculs per month (black tin) and for this 4,000 coolies are employed,—an inadequate supply, according to the views of the merchant proprietor. People, who criticize the Chinese mine-proprietors for their lack of perception and their backwardness, are inclined to forget that machinery is apt to be trade-destroying as well as labor-saving. At Kamunting, Mr. Boo Bee courteously told the writer that monthly expenses total \$40,000, of which \$32,000 represent labor.

The open-caste at Kamunting is some 2,400′ long and about 100-150′ across. The depth of the karong averages 30-40′. This pit is being carried steadily across the property, the discarded overburden and wash dirt tailings being dumped at the exhausted side. The tin is extracted in the common landshoots (without preliminary puddling), of which there are 17 double sets. Only a fair extraction is obtained. The majority of coolies are on day's pay, but the removal of ground is also undertaken on contract, at the rate of \$9.50 per 50 yards for Karong and \$7.50 for overburden. The Kamunting appears to have a large stretch of virgin ground yet available.

Turning from this essentially Chinese mine to the European influence, it is gratifying to record a substantial advance. In Perak, and especially in the richest section of it, Kinta, the European control is of particular strength. It may be calculated that nearly 1|5 of the Perak tin yield is derived from properties owned and managed by white men. Yet the number of mines falling under this category is small. Below is given a brief summary of the position and prospects of the principal producers of to-day, together with two or three properties approaching the producing stage, such as Redhills and Rambutan.

TRONOH TIN MINES.—This leading producer, at the present day, was floated in 1902 with a capital of £160,000 which has now been almost returned to original shareholders. There are still some doubts as to the character of this wonderful deposit, which are being removed by a series of boreholes, but the general form of the ground is well-known. The run of the deposit is approximately north and south and along the west ranges a hill of shale, slate, altered sandstone, and detritus. On the other side is a bed of limestone, whose sub-outcrop is cut at 40′ in the main vertical shaft. The width of the deposit is about 500′, its length over 2,000′, and the depth uncertain. A drill struck limestone in one spot at 147′ and, at another, failed to bottom at 190′—the two bores having been 1,800′ apart. The value of the karong, a sandy clay, may be estimated at 1½ per cent. Owing to an inconsistency of policy and uneconomical distribution of plant, working costs at the Tronoh are deplorably high and some sort of reform must surely be soon effected to bring them down to a reasonable figure. It is proposed to work the deposit by means of the main vertical and one other, outside the mine area to the west. Possibly open-casting is the solution of the difficulty, though this would probably necessitate an enormous amount of non-productive work. Open working was largely undertaken by the former owner, Mr. Foo Choo Choon, but this cannot be continued, under present conditions, without causing slips from the hill. The eivdence of the boreholes, however, must assist considerably in the formulation of the new working scheme.

There are two sets of treatment plant, each including four puddlers and four or five landshoots. Some 20,000 trucks are treated per month for a yield averaging upwards of 3,000 piculs of black tin. The overburden is in many parts 50-60′ thick.

Tests have lately been undertaken at the mine to determine the important question as to the relative economy of wood fuel and imported Bengal coal. As at Tambun, the latter is to be regarded with greater favor, and it seems probable that the use of coal will soon become far more general than it is at present.

FRENCH MINING COMPANY.—The *Société des Etains de Kinta*, popularly known as the French Mining Company, was formed in Paris as far back as 1880 and must be placed among the greatest pioneers of scientific tin-mining in Malaya, although its methods have involved no exceptional engineering acumen. It is surprising that the prosperity of this venture, whose profits have totalled over 8,500,000 francs and whose continued success is evinced by last year's record profit of about 1,300,000 francs, has not led to the introduction of more French capital into Perak, for no mining investors are gifted with greater pluck and discernment than the Parisian.

The French company holds several properties, but of paramount importance are those situated at Kampar and Lahat. The former comprises a large stretch of alluvial, on which there are three workings, two open-caste and the third shafted. The average grade of the ground, taking the full face of 50′, is estimated to run a picul to the 50 yards, but as a large percentage of barren overburden is removed, the grade of the ground passing through the puddlers may be raised, to perhaps 20 katis per yard. From the three workings, 2,100 piculs per month are won. It is now proposed, however, to establish a central power station, operated electrically from a waterfall near the property, which would enable the manager (Mons. Legros) to attack some lower layers of karong, proved to exist between 110-150′ deep, requiring more powerful pumping plant. The fall for the turbine will have a head of 1,300′ and register 60 galls. per second. According to the new scheme, about 2,000 tons of ground per day should be puddled and sluiced.

LAHAT.—Of greater interest, mechanically and geologically, is the French company's Lahat property. The origin of this ore-body in the limestone is yet uncertain, having baffled the Government geologist and all other observers. The mass consists of a pipe or chimney of calcite-cemented crystals, netiher waterworn nor symmetrical, about 25′ in diameter and dipping almost vertical. At some depth, it makes into ramifications, but at 160′ the body is still strong and rich. Round the edge, iron pyrites is to be noted, but no quartz or tourmaline, suggestive of lode origin, has been detected. In fact, this is most surely not the result of stanniferous solutions or impregnations, but has been mechanically formed in some inexplicable manner. The richness of the body, which runs up to 40 per cent tin oxide (74 per cent metal) militates against the simple hypothesis of a cemented pocket of alluvial. How has the concentration occurred? The Government Geologist is praying for a recurrence of the phenomenon, which may throw further light on the question. But the majority of other tin deposits in the limestone have proved true lodes, associated with iron, copper, and arsenical pyrites.

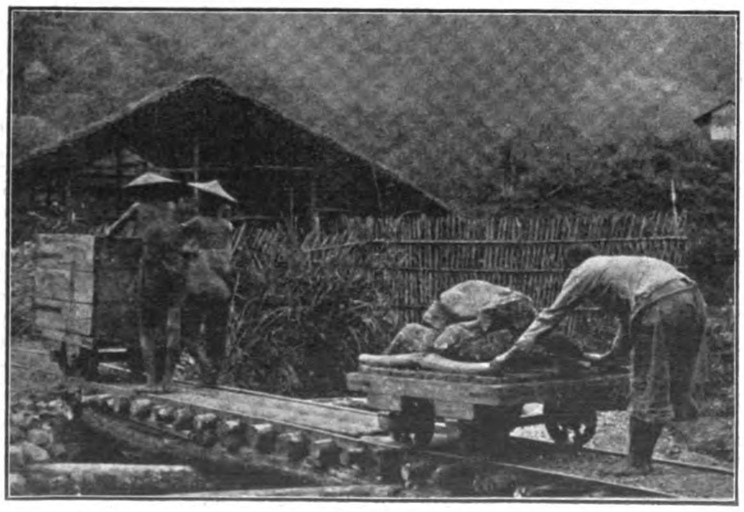
The Lahat mine is also noteworthy for its efficient electrical equipment and gas producer plant. There are two Letombe gas engines of 35 h. p. each and, with the use of charcoal fuel, the manager is able to keep his power costs at a figure (3 cents per h. p. per hour) about ⅓ of the local average. Some 700 to 750 piculs per month are produced at this Lahat mine.

PUSING LAMA COMPANY.—The Pusing Lama Tin Mining Company, floated in London with a capital of £98,000 has recently improved in outlook very considerably, owing to the success of systematic testing operations conducted over the property. It is a proposition of several parts. The mainstay of the company appears to consist of the large gravelly low grade body, including stanniferous lumps of quartz, conglomerate and other rock fragments, extending from Redhills. Fifteen stamps, in conjunction with six puddlers, are employed in crushing the stones, but this mill is inadequate for the quantity derived from upwards of 1,000 trucks of ground per day and considerable pebble accumulations are being reserved for subsequent treatment. The ordinary clay and gravel averages 3 katis to the yard, whilst the hard lumps are estimated at ¾ to 1 per cent. But mill returns, equivalent to half the aggregate yield, have lately been augmented by the contributions from a new section of the property. In the course of his prospecting operations, Mr. Currie struck a rich body overlying a boss of modified granite, which certainly appears to be a highly decomposed contact lode. Of the value of the strike, it would yet be premature to speak with any suggestion of confidence, for its persistence is improved. Rich stuff has been obtained in three trial shafts, whilst the deposit has been missed in others. An adit, being put in to cut the contact at a depth of 50′, should afford satisfactory evidence as to the significance of this new asset, which is at least of good promise.

As for the alluvial section, the lie of the country is unfortunately unsuitable to make hydraulicing economically possible, though a limited section capping the hill is to be run through sluice boxes by this method. The policy of the Pusing Lama appears to be one of caution, and the necessary additions to plant are being made gradually, without the expenditure of large amounts. Recent installations include a Wilfley table, a revolving concentrating table, and magnetic separator for the specular iron associated with the cassiterite. The management of the property is in particularly able hands—a fact tending to minimize the natural speculativeness of the proposition. A yield of about 1,200 piculs of block tin per month is regularly declared.

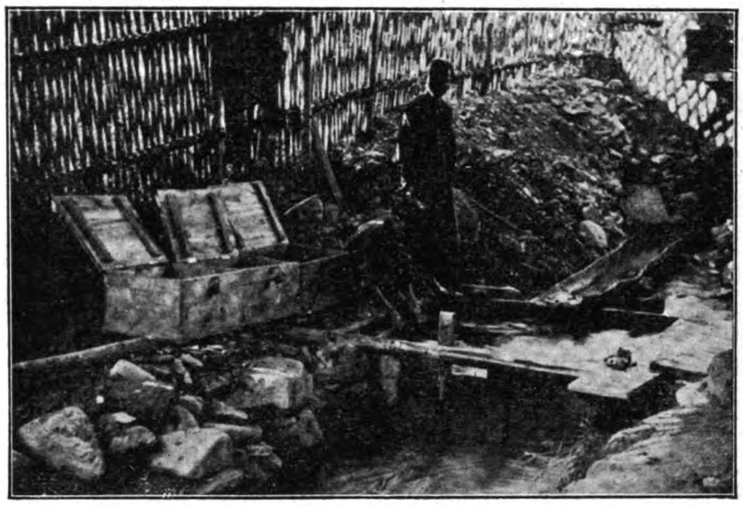
BRUSEH: A UNIQUE PROPOSITION.—Among the several prosperous hydraulicing ventures in Malay, the Bruseh near Bidor calls for prominent notice. For this property is not only the lowest-grade of any class operated in the peninsula, but is probably the cheapest-worked and lowest-grade lode proposition in the world. When some of its costs are given, no attempt, of course, should be made to compare them with the expenditures of the average lode mine, where conditions are likely to be radically different. But Bruseh figures, besides being highly creditable to the management, are of principal interest in the mining world to emphasize the necessity for closely scrutinizing relative conditions when endeavoring to establish instructive comparisons between the costs of two mines. In a Transvaal gold-mine, gold recovery costs 23s. per ton crushed; at Bruseh, with a lode proposition, requiring to be blasted, tin is won at 12 cents per yard. These parallel statements, in one sense absurd in their juxtaposition, pertinently illustrates the limitations of such comparisons.

The Bruseh company holds about 1,100 acres of hill land at the foot of the main granite range. Prior to the arrival in 1904 of Mr. O'Brien, the able Californian manager, work was principally done on the decomposed surface soil on the hillsides. The formation consists of silicious schists (in contact with the granite) whose bedding planes head away from the contact, dipping 50 degrees south-east. The tin ore is found in a series of small impregnation veins, about ½″ thick, in a foulted zone near the contact. These



TRANSPORTING ORE TO THE SMELTER

MOULDING MOLTEN TIN INTO INGOTS



SLUICE FOR PANNING OUT FINE ORE

BASKET-TROLLEY FOR CONVEYING "SLUICED" ORE

veins strike slightly north of west and south of east, and dip 38 degrees approximately north. At present work is proceeding on a large hill, 240' high, giving a cutting bank 220' high in three separate mines. The ground is first "T" drifted, and broken with heavy charges of powder. Water through a 3" nozzle, at 130 lbs. pressure, is turned on to the fallen schists, which are beaten back against the bank with giants until thoroughly disintegrated. The ground is then allowed to pass through the sluice boxes, which are 4' wide, 20" deep, graded at 1 in 24, riffled with inverted rails 1½" apart and are 300-400' in length. The greater part of the tin is won in the first three boxes or 36' length of sluice. A clean-up is made every third or fourth day and takes about 3½ hours. The water used in each box averages 750 cub. ft. per minute. The ore as taken from the riffles contains 10 to 22 per cent of dirt. Seven miles of pipe line serve the monitors.

The figures for one mine (owned and worked by the Bruseh company) for a recent six months, are instructive. In 181 days, 209,000 cub. yds. were removed (1,155 per day), of an average value of 391 kati per yard—say 23 cents—at a cost of 12 cents per yard. No other hydraulicing company in the Federated Malay States can produce figures to compare with these.

JEHER HYDRAULIC.—The Jeher Hydraulic Tin Mining Company, working on a smaller scale than the Bruseh, though on the same line of formation, was floated some 18 months ago. Its ground is considerably richer than that above described. The tin occurs in narrow and rich quartz veins in decomposed schist, which needs blasting. A couple of monitors are engaged in clearing away the overburden worth about one kati per yard, is all put through the sluice-boxes. The strike of the formation is east and west, and the dip south. An average yield of 500 piculs of black tin is maintained. There are several large low-grade bodies on the property, whose profitable treatment may be found possible. It cannot yet be said how long the boss of tin-lode-containing schists will prove amenable to present cheap methods of treatment, before the quality of solidity is assumed below the decomposed zone. The water-race in use is 5 miles long. 7½' wide, and 3' deep, with a fall of 16' per mile. The main pipe line is 2 miles long 22" in diameter and has a vertical head 604'. Chinese miners had accomplished considerable work on the deposit, before the management was taken up by Mr. Proust, but a suitable scheme of exploitation had not been adopted.

OLD HYDRAULICERS: GOPENG GROUP.—In the Gopeng District, there are three large hydraulicing propositions under the control of Messrs. Osborne & Chappel, the engineering and mining pioneers of the Malay States, who were among the first to realize the possibilities of working low grade bodies on a large scale and have profited fittingly by their perception. The Gopeng company itself, which worked with two monitors in 1892, has been producing and paying dividends ever since. It was the second hydraulicing venture to start in the country, a failure near Charnkat Pari having been the first. As many as ten monitors have been simultaneously employed. Today, a yield of about 36 tons of black tin per month is registered and last year's dividends of 25 per cent will probably be exceeded by the payments for the present year, owing to the stronger tin market. A considerable revenue is derived from the sale of wolfram. The prospects of the venture are still good, though life estimates cannot be safely made.

The New Gopeng was floated in 1902, with a capital of £40,000, and holds 650 acres of ground. Last year's dividend was 20 per cent. An average output of 17 tons is recorded every month, from the ground broken by five monitors.

The Kinta Tin Mines, under the same management and in the same area, was floated in 1898, with a capital of £60,000, all issued. It has since paid 17 dividends, the 1905 distributions totalling 20 per cent. The ground now under attack, running little more than 1s. per yard, is yielding an average of 17 tons per month. An additional monthly income of $5,000 is derived from water-rights.

REDHILLS.—The Redhills, Ltd., a non-producing company under Messrs. Osborne & Chappel's management, should be adding to Perak outputs in a month or so. This concern was recently floated with the reasonable capital of £40,000 and holds a large body of gravelly alluvial, adjoining Pusing Lama. It is being equipped on highly economical lines, with a view to the saving of labor and effecting a high extraction, well in advance of the Perak standards. For the shifting of the ground, which contains from 10 to 15 per cent of tin-bearing rockfragments requiring pulverization, a steam navvy and a Blondin conveyor have been installed. By the agency of these, the dirt is dumped on an elevated place above the treatment plant, where it is further disintegrated by monitors before passing into longitudinal puddlers, below which are 1" and ½" and trommel. The classified rock is delivered into the 25 (850 lbs) stamp battery, whose pulp is concentrated on Wilfley and Bus tables. For the trommel sludge there will be 200' of rifle boxes, 3' 9" wide, and graded at 1 in 20. A magnetic separator will be installed, as at Pusing Lama. It is estimated that 4 per cent. will be won from the crushed product, at a cost of 2 per cent. Taking the proposition generally, an average yield of $2.50 per yard should be recorded, or about 1,000 piculs per month. An extension of mill may be found advisable at later date, but this largely depends on the proportion of milling ore met with in actual working practice. Some consider that the 25 head battery will be unable to cope with the rock found, on the suggested basis of 1,000 tons of ground per diem.

SUCTION DREDGING.—Rambutan, Ltd., a daring project embarked upon by the same firm, is to-day being as critically watched as any venture in the four States. For it involves the utilization of the first suction dredge yet worked, on the paddock principle, on Malay alluvial tin. Its success or failure will be considered of great significance and determine whether, as one may reasonably anticipate, the dredge is to form an important factor in the industrial operations of the future. There are certainly many stretches of alluvial upon which such plants might be placed with fair prospects of success, but a pioneer has been needed to put the scheme to practical test. The gravelly alluvial to be dealt with at Tanjong Rambutan is low grade and gravelly. So far as can be determined, there is nothing in it liable to disable the large centrifugal pump, even though there may be occasional calls for new liners. A recovery of not more than *1s.* per yard is expected, while costs may be *4d.* or *5d.*; but no precision can be introduced into these hazardous estimates, at present. The pontoon made of local hardwood, is 50×50×6', and, with its burden of machinery, now being put into place, should weigh some 350 tons.

This dredge (Rambutan, Ltd.) is so designed as to draw from the a depth of 10' vertical (16' on incline) and to throw 40-50'. This means a working face of about 60'. A 16" intake pipe serves the centrifugal gravel pump, which weighs 18 tons and is capable of putting through nearly 2,000 yards of solid per day. This plant is of Australian manufacture and is being erected by an Australian, Mr. Tobie—a fact not surprising when the experience of Australian and New Zealand engineers of dredging and dredging machinery is remembered. Rambutan, Ltd., is capitalized at only £27,000, which possibly means the fault of under-capitalization and a lack of reserve strength. However, this fault is always less harmful than excess of stock and, if found disadvantageous in the case of an Osborne & Chappel concern, could doubtless soon be remedied.

SOME OTHER EUROPEAN VENTURES.—Few other European ventures are of importance. The Chendai-Meru hydraulic mines, near Ipoh, held privately by Mr. Ogilvie, make good steady profits. The Kinta Association, whose chief holding is at Tanjong Rambutan, is making small profits, but is conserving its strength in the hope of obtaining some new property of value. This company, formed in Singapore in 1898, has paid dividends aggregating about 85 per cent on its ordinary share issue of $120,000 but its holdings have not proved inexhaustible. Mr. Petherbridge, the manager, hopes to be able to start hydraulicing on another section of the Rambutan property shortly, if further prospecting gives satisfactory indications.

SUNGEI BESI.—In Selangor and Negri Sembilan, where the European mining influence is comparatively inconsiderable, there are few properties of prominence. At Sungei Besi, an exceptionally large and deep opencaste is held by three Tronoh directors, by means of which a large and rich body of alluvial is to be worked. Chinese miners, by shafting, have in the past extracted large quantities of ground but by no means exhausted the mine, which the general manager, Mr. Grant Mackie, considers can be most economically and effectually dealt with on the lines adopted. A depth of about 80' has been attained, and the floor of the cir-

cular mine is now on high-grade karong. Great difficulty has been experienced on account of slips. An enormous body of waste fell into the mine after the rains early this year. Production has been slowly proceeding since January, 1904, during which 2,800 piculs have been turned out. It is estimated that at least 20 tons of black tin will be produced per month, working at the rate of 400 yards puddled daily, but rich patches are likely to throw out all regular estimates. Costs should be low, when operations are proceeding smoothly. The exploitation of this deep ground by opencaste was at first regarded as a daring experiment in the neighborhood. A feature about the deposit is the purity of the tin-oxide, which is often of a light waxy appearance and is allowed a high metal percentage by the Straits Trading Company.

Rich Bunch.—At Salak, there is a very remarkable arsenical deposit, also being opencaste to considerable depth. This is privately held by Mr. Cummings and a few others. Before abandonment as unpayable, a borehole was put down to test greater depths and gave a good show of tin oxide and arsenical pyrites. Upon further mining, the body indicated was opened up and with the aid of a horizontal puddler, capable of treating up to 400 loads daily, tin at the rate of 25 tons per month was produced. At the time of the writer's visit, alluvial ground was being extracted by the basket (at a depth of 700'), that certainly ran 80-85 per cent tin oxide or, say, 55 per cent metal. How extensive such a wonderful enrichment can be, cannot be surmised, especially in view of the geologicall problems associated with the deposit. With the ore, though not intermixed, a large quantity of mispickel is found, as in many of the deep deposits.

Apropos the mixture of arsenical pyrites with the tin, customarily removed in calcining furnaces, it must be noted that Government regulations, prompted by the ill-effects of the fumes upon vegetation and perhaps livestock in various parts of the county, are to be made so stringent as to drive producers direct to the Straits Trading Company with their ore. This company, I hear, is now experimenting with mechanical separators which should remove the arsenical fume evil, whose seriousness in some districts has been very conspicuous.

Sipiau Tin Company.—In Negri Sembilan, the principal producers today, under European control, are hydraulicing in the neighborhood of the capital, Seremban. The Sipiau Tin Company, formed in 1899, with a capital of $230,000, is now working with two monitors on a body of decomposed pegmatite (micaless granite), through which several veins of tin stone run. One of these lodes has lately been traced for 500' and tapped at several points about 30' below the level of natural disintegration. It has not been possible to restrict the monitor cutting-face to the immediate region of these tin-carriers, and large bodies of practically barren ground have passed the riffle-boxes. An average of 20,000 yards is treated per month for nine tons of tin-oxide, of which four tons almost cover costs. The property is managed by Mr. Tedlie, who has done much hard and beneficial work for local mining during recent years.

Seremban Tin Company.—Not far distant Seremban Tin Company is controlled by Messrs. Osborne & Chappel and is perhaps the least noteworthy of the concerns managed by this firm. It was floated in Redruth, Cornwall, in 1898, with a capital of £20,000. An average yield of 8 tons of 70 per cent black tin is recorded from a large lowgrade deposit, with a 40' face.

Held in Germany.—Sudu Seremban is held privately in Germany, and the old property is now almost exhausted. Five 2½" monitors have been employed Some months ago, an average of 15 tons per month was won from 60,000 cub. yds. The deposit lay on decomposed pegmatite, also containing quartz stringers. A 9 mile pipe line is an asset of the holders, which may be shortly turned to account on a new property whose acquisition is contemplated.

Pahang is a province which must necessarily be accorded delicate handling, for fear of irritating the tender susceptibilities of those whose faith in its *marvellous*,—though ill-defined and unsubstantial mineral wealth has been unshaken by the revelations of recent years. Perhaps it may be diffidently suggested, however, that the reputation of this *Cinderella* of the Federation has been largely based on the shadowy foundation of sentiment and conjecture, and that, although it can be justly claimed that Pahang is comparatively undeveloped and suffers sadly from lack of transport facilities, the country has not improved upon acquaintance. It seems that the tin has been ill-distributed on either side of the great granite dividing range, and that, although a gold field was thrown-in by way of make-weight on the east, the west has infinitely the best of the measure.

The Eastern State.—The field under exploitation by the Pahang Corporation in the Kuantan District falls under a different category and, despite the peculiar transport, fuel, and labor difficulties encountered by this plucky concern in the past, is likely to retrieve its former prosperity. So ample and straightforward are the circulars and annual reports published by the company, that only brief reference to its position need here be made. After years of variable results (illustrated by its profits for the last six years, viz:—£27,321, £5,193, £22,240, £11,548, £3,076, and £2,302) the entire proposition, underground and on surface, is now undergoing complete transformation, which must in large measure check the troubles complained of so long. By the installation of the electric power scheme and of new mills with heavier stamps and new dressing floors, the company will overcome the evergrowing fuel difficulty, make themselves less dependent on a peculiarly poor labor-supply, and effect a higher extraction from the unoxidized ore of the lower levels. Five hundred coolies will be released from wood-cutting.

A Masticator.—The old battery was insufficiently powerful—was unable to properly *masticate its food*. The Pahang Corporation is a concern of many lodes, which run as fissures through the granites and metamorphosed and sedimentary rocks, associated with copper, tourmaline, chlorite, and mica. It has been pointed out that the decreased profits of the past year or so have been due to increased working costs and a falling-off in grade, which was 2.9 per cent in 1903 and 1.9 in 1905. Under the new conditions, the greater scale of working and the introduction of additional labor-saving appliances should satisfactorily influence costs, and the advance in the price of tin, especially appreciated by so mechanical a venture, has been equivalent to a large increase in the value of ore reserves. The prospects of the company have, indeed, been happily improved, although it must ever bear the burden of a heavy capital.

EXPERIMENTAL TUBE-MILLING IN A KOREAN GOLD MINE

Writing to the *Mining and Scientific Press* (San Francisco), recently, A E. Drucker, M. E., of Chittabalbie, Korea, says:—

We are at present experimenting on a practical scale with regrinding our concentrate in a tube-mill with cyanide solution. It occurred to me some months ago that cyanide solution could be used just as well as water, when reducing our concentrate to slime, and incidentally some of the gold could be extracted while grinding. In other words, the tube-mill could be used as a grinder and agitator combined.

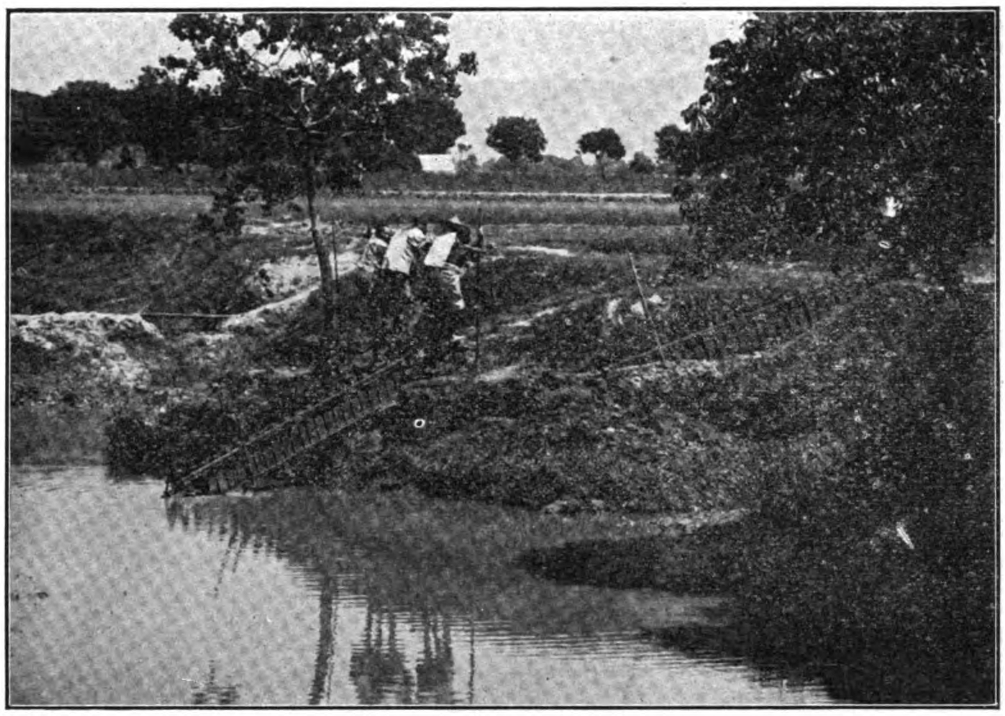
This company (Oriental Consolidated Mining Company) has constructed an experimental plant consisting of one tube-mill (2½ × 12½'), two mechanical agitators with plow shoes (8 × 6' diam.), three filter and settling-boxes (4×5×5'), 48 separate-compartment zinc-boxes, two sumps, and one stock-solution vat. An electric motor furnishes the necessary power. The tube-mill was constructed in this company's shops.

The method is a continuous one; the concentrate is put into the hopper with cyanide solution and upon passing through the tube-mill is nearly all ground to slime and a good percentage of the gold is extracted. At the end of the mill is a spitzkasten (3" wide by 1½' long by 1½' deep) supplied with clear water from the bottom. When discharges from the bottom of the spitzkasten is coarse concentrate and clear water, that passing over the spitzkasten is the cyanide solution and slime. The coarse concentrate that may escape from the tube-mill is caught in the settling-boxes and again reground, while the overflow contains very little value (tests 0.005 to 0.01 per cent KCN and assays 6 cents per ton). We can not arrange to run this overflow or waste-water solution through a separate line of zinc-boxes. In this small plant the value of this waste solution will not amount to more than $2 to $3 in 24 hours. The slime concentrate and cyanide solution pass on to an agitator which has been set in motion (13 r. p. m.) and the muller lowered. Here the product is agitated for about 15 hours, the muller is then raised 2', the agitator stopped and the concentrate allowed to settle. It takes about 1 hour to settle clear; by the addition of some milk-of lime it could be made to settle in half an hour. I prefer to use as little lime as possible because the strong alkaline solution consumes a large amount of zinc. The clear cyanide solution is decanted by a float siphon into filter-boxes and from there it is run through the zinc-boxes and the gold precipitated. Next, the strong precipitated cyanide solution from the sump is pumped up to the agitator as a wash to partly remove the gold remaining within the settled concentrate. The muller is allowed to work down on the charge and agitate for a few minutes, then settled and decanted. Following this come two successive weak cyanide washes to remove cyanide and gold, and finally a water-wash which is run through a row of zinc-boxes to waste. Now the charge of about 5 tons of clean concentrate is ready to be discharged into the creek. A little water is added, the muller set in motion and lowered, the discharge-hole opened, and now the agitator will discharge itself readily and prepare for a new charge. The total treatment takes 24 hours, both agitation and decantation being done in the agitators.

(Continued on page 203.)

CRUDE OIL FOR JAPAN

A contract has been signed between three of the leading oil companies of California, *viz*, Union Oil Company of Los Angeles, Associated Oil Company of San Francisco, and Graciosa Oil Company of California, and the Toyo Kisen Kaisha (Oriental Steamship Company), of Japan, for the delivery of 500,000 bbls. of crude oil *per annum* for 10 years. It is understood that this oil is to be used as fuel for various Japanese steamers. It is further intimated that still greater oil transactions have been inaugurated by Mr. Henry Crocker, of California, in connection with prominent Japanese and with the Graciosa Oil Company. As a result it is expected that three large refineries will be erected in Japan, one at Yokohama, one at Kobé, and another at Moji. The new tariff gives a 20 per cent duty on crude oil and a duty on refined oil of about 40 per cent. This difference in duty between the crude and refined oil, together with the market advantages for the by-products, makes a very comfortable working margin for the refineries located in Japan. This very large transaction in California oil will necessitate the operation of a line of tank steamers between California and Japan; and it is understood that contracts have been arranged for the construction in Japan, and the operation under the Japanese flag, of five large tank steamers for carrying this crude oil to the Japanese refineries. This deal means a remarkable advantage to the California oil fields; but it will signify a great deal more for the Japanese merchant marine and for the industrial expansion of Japan. If the Japanese Government supports this new industrial development with the same national spirit that it gives to all other important enterprises, it will result in the Government practically sustaining and assisting in the development of a great Japanese oil industry. The steamers for carrying this oil will be constructed under a Japanese subsidy, the industry will be further protected by a tariff, and no doubt further aid will be given in trasportation of the products into the markets of China, if it shall become necessary.



IRRIGATING TREAD-PUMP IN COMMON USE ON CHINESE FARMS

PUMPING MACHINERY FOR CHINA

Consul-General James L. Rodgers, writing from Shanghai, his post, to the Department of Commerce and Labor at Washington, recently said that while the demand for steam pumps and hydraulic machinery is not now much in evidence in China, it will probably develop slowly along with other lines, the Chinese of late having exhibited great interest in all classes of machinery. However, with cheap labor and the peculiar and crude but effective Chinese pumps, it may be expected that the use of such modern devices for a long time will be confined almost exclusively to cities. The water wheel, turned by the buffalo, and the tread pumps, operated by the coolies, will be difficult to supplant for irrigation work, and it is hard to imagine any other use to which a steam pump could be put in the country districts under the present economy of the people.

JAPAN'S INDUSTRIAL ENTERPRISE

Reference has already been made in our columns to the extraordinary activity that prevails in industrial circles of Japan, for the promotion of new enterprises and the extension of existing works, and it is interesting to make a closer study into the nature of the newly-promoted companies and to consider the amount of capital involved. The following table shows the principal undertakings newly projected and the amount of capital to be invested. Some of these have already completed the first call on their shares, others are now making the first call, while the majority are still in an initial stage:—

		Capital.
Rumoe Colliery Co.	-Y-	1,000,000
Tokyo Trust Co.		1,000,000
Kushiro Colliery Co.		2,000,000
Japan Match Co.		600,000
Meiji Iron Works Co.		500,000
Mankan Salt Co.		1,500,000
Banzai Life Insurance Co.		500,000
Tozai Petroleum Co.		1,500,000
Otaru Timber Co.		1,500,000
Imperial Flour Mill Co.		500,000
Japan Patent Medicine Co.		200,000
Tokyo Electric Power Co.		6,000,000
Silk and Cotton Spinning Co.		3,500,000
Japan Marine Produce Co.		3,000,000
Kokura Railway Co.		3,500,000
Mutual Fire Insurance Co.		1,000,000
Imperial Fertiliser Co.		3,000,000
East Asia Flour Mill Co.		2,000,000
Oriental Timber Co.		500,000
[The above are promoted in Tokyo.]		
Hogo Petroleum Co.		1,000,000
Asahi Fishery Co.		200,000
Japan Solid Fertiliser Co.		200,000
Korea Raw Cotton Co.		200,000
Daisei Cotton Spinning Co.		2,000,000
Osaka Industrial Co.		200,000
Ojigawa Electric Power Co.		12,500,000
Union Fire Insurance Co.		5,000,000
Kyoto Street Railway Co.		3,500,000
Kyoto-Osaka Electric Railway Co.		7,000,000
Oriental Marine Produce Co.		500,000
Artificial Fertilizer Co.		700,000
Tsushima Electric Power Co.		1,000,000
Nagoya Gas Co.		2,000,000
Tokai Warehouse Co.		1,000,000
Nagoya Electric Power Co.		2,000,000
Japan Silk Refining Co.		100,000
Yokohama Sugar Refining Co.		1,500,000
Yokohama Fertilizer Co.		1,000,000
Kii Timber Co.		100,000
Sulphuric Acid Fertilizer Co.		200,000
Korea Colonization Co.		1,000,000
Manchuria Electric Light Co.		250,000
Japan-China Fire Insurance Co.		5,000,000
Glass Manufacturing Co.		1,500,000
Anglo-Japanese Bank		20,000,000
Shanghai Silk Spinning Co.		590,000
Total		-Y-104,740,000

Of the various enterprises enumerated above, those in which Japanese and foreigners are conjointly interested are estimated to amount to something like -Y-28,000,000. Although the exact amount of the share of the Japanese capitalists in these joint enterprises is not definitely known, it would be nearer the mark—by adding those which may have been omitted in the foregoing table and the first call of the South Manchuria Railway Company, amounting to -Y-20,000,000—to estimate the aggregate capital of the new undertakings so far made public at between -Y-100,000,000 to -Y-120,000,000. Needless to say, the Tokyo capitalists come in for the lion's share in the new enterprises, their quota being 34 per cent of the whole. Comparatively few new industries are projected in Osaka, though the extension of many existing factories is under contemplation. It is believed, however, that sooner or later Osaka will be infected by the industrial mania which is now at its height in Tokyo.

Some of the following companies have already increased their capital or have undertaken the issue of debentures, while others are considering the advisability of similar steps:—

		Increased capital or loan.
Iyo Electric Power Co.	-Y-	180,000
Tokai Electric Power Co.		250,000
Japan Credit Mobilier		7,500,000
Tokyo Stock Exchange		2,750,000
Tokyo Marine Insurance Co.		500,000
Hakodate Dock Co.		600,000
Kawasaki Shipbuilding Works		6,000,000
Osaka Alkali Co.		440,000
Owasi Clock Manufacturing Co.		176,000
Kyoto Cotton Flannel Co.		600,000
Japan Raw Cotton Co.		1,000,000
Union Cotton Spinning Co.		800,000
Temma Weaving Co.		500,000
Osaka Ryuso Fertilizer Co.		500,000
Mikawa Cement Co.		100,000
Settsu Oil Co.		500,000
Tokyo Fire Insurance Co.		5,000,000
18th Bank		1,750,000
Tokyo Electric Light Co.		1,850,000
Fruit Wine Co.		300,000
65th Bank		500,000
Marusan Beer Co.		1,550,000
		-Y-33,706,000

Adding the amount of capital required for extension of existing works to that of new undertakings, the total will come to between -Y-100,000,000 and -Y-150,000,000. The large amount of funds involved in the enterprises conjointly promoted by foreigners and Japanese is deserving of particular attention.—*Hongkong Telegraph.*

BRIGHT GOLD-MINING PROSPECTS IN THE PROVINCE OF BENGUET, P. I.

In an official report, Governor Pack, of the Province of Benguet, P. I., speaks encouragingly and almost enthusiastically of the prospects for gold mining in his province. He says:—

We have felt heretofore that in our report regarding the mineral resources of this province the conservative course was the wisest to pursue, and that a steady, sure, continuous expansion in the knowledge of our mineral wealth, and the diffusion of such knowledge rather than mere guesswork based upon the researches of amateur prospectors, would finally produce the best results.

This is not a prospectors' ideal gold-field. Our gold does not lie in pockets where by luck and after much research a fortune may be picked up in a day; and the average prospector of the Philippines may for this reason consistently give adverse report against the reports of wealth in gold in Benguet.

Our products of gold are to be found in what is generally classed as low-grade ore, though throughout the mineral range are found seams of various thickness which are exceptionally rich, and it is the rule rather than the exception to find all assays of mineral-bearing ore exceeding in value $10 per ton.

Practically all of the central range through the province is mineral bearing, as well as the eastern range, or central range of the District of Kayapa, also a part of this province. With a large field of gold-producing ore there can be no question but that we safely may present and solicit the attention of capitalists desiring safe investment, to the subject of mining in Benguet as a business proposition, not a prospect.

Whereas in the past this was an inaccessible district, now transportation is made available by the opening of the Benguet-rd and its maintenance throughout the year. Thus the investor may surely, safely, and, compared with the past, at small expense, transport his machinery to location. With the limited means available at present the provincial authorities will do all possible to construct main roads toward mining localities, thus farther facilitating transportation for those enterprises which would so much benefit the province.

We are now entering on that era in which we shall no longer speak of mining prospects but of mines. Hundreds of prospectors have come and gone; we now have miners and mine corporations, constructing and operating. There have been 544 mining claims located within the province, of which 105 have been located in the past year.

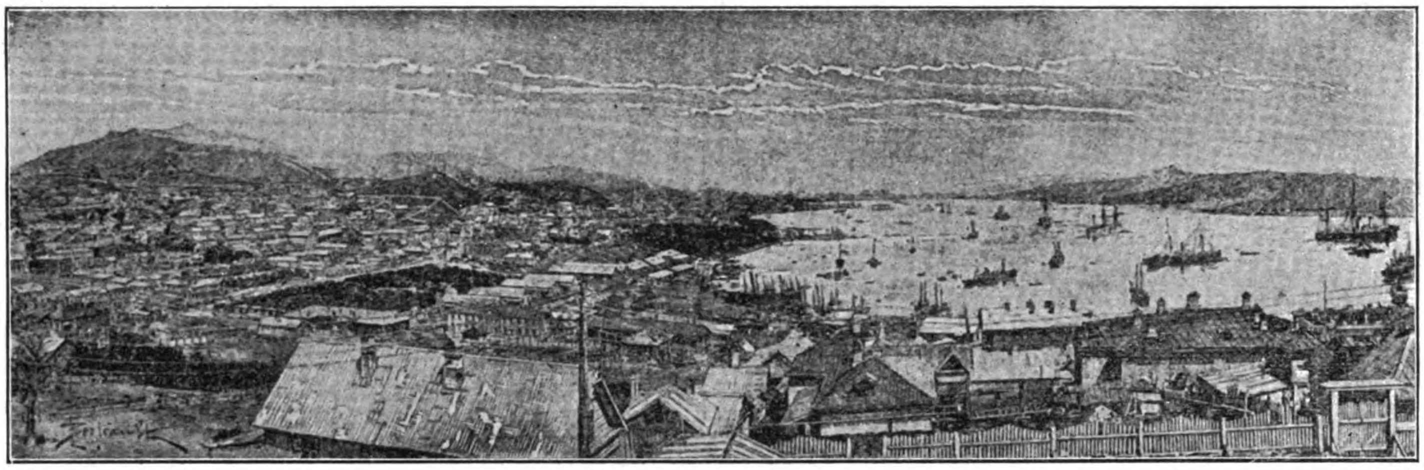
The Benguet Consolidated Mining Company, represented by Mr. Eye, a mining engineer from Colorado Springs, Colorado, with a capital of $200,000, has almost completed a new plant with modern equipment with a capacity in its cyanide plates and stamp machinery of about 60 tons of ore per day. They are located in the Antimok mining district and in their ore and dirt find only the one mineral—gold. Ore is easily crushed and the assays average $14.80 per ton. Mr. Eye reports this to be an ideal mining country, calling my attention to the fact which will interest practical men,

(Continued on page 199)

MUNICIPALITY OF VLADIVOSTOK PROJECTS LARGE PUBLIC WORKS

Since the restoration of peace between Russia and Japan, the Municipality of Vladivostok has been consumating plans for the construction of a series of public works which will require an expenditure of at least $6,000,000 gold. The authorities have in mind the creation of a loan for the granting of concessions to carry out the enterprise, and some features of the general proposition may be inviting to foreign enterprise and capital.

The city has no funded debt at present, but owes to the central Government some $150,000 gold for provisions supplied in anticipation of a siege during the war, and about $100,000 short-time loans have been recently negotiated for a hospital and a school building. On the other hand, it owns all the vacant land on the peninsula, on which Vladivostok is situated, for a distance of some 13 miles, and still holds a great deal of valuable land in the city itself, which could be used as security indirectly, though a foreign corporation or person could not hold it itself. It also owns warehouses which bring in a good income. Lenders could not count on securing any interest or sinking-fund payments from the present revenues of the city, but would have to base their calculations on securing the return from the works constructed. The revenues and expenditures of the city ordinarily balance exactly. This year it is estimated that they will each come to about $300,000 gold. A loan or concession would require the approval of the central Government.



CITY OF VLADIVOSTOK, WHERE MANY PUBLIC WORKS ARE PROJECTED

SOME URGENT WORKS.—The most urgent of these improvements, as set forth by Mr. Roger S. Green, American Commercial Agent at Vladivostok, are waterworks, sewerage system; an electric railway, light and power system, building of wharves and warehouses on Golden Horn Bay, the construction of a small harbor for coasting vessels on Amur Bay near the market, the building of markets, and the paving of streets. The city also wishes to erect a large building, or series of buildings, on the ground now occupied by the city garden, the basements to be used for storage of merchandise, the rear being right on the wharves, and the other floors for offices, part to be set aside for an exchange or chamber of commerce, for municipal offices, for the municipal bank and library, and for a theater and club. The erection of buildings for cheap lodging houses is also planned. Rents are now so high that an unfurnished apartment of five rooms, for instance, even at some distance from the business center, can not be secured for less than $100 gold per month. A steam bakery, steam laundry, a public bath house, a slaughterhouse, and small electric ferries on the bay are also among the improvements proposed. More hospitals, schools and gardens, boulevards, places for sea bathing, etc., are desired. An addition of $250,000 gold is needed for the capital stock of the municipal bank and for a Mont de Piété or city pawn shop.

METHODS OF PAYMENT—The municipality has no funds available for beginning by itself this somewhat ambitious program, but it is felt that these undertakings, if properly managed, should most of them be profitable investments. The municipality is desirous of securing a loan for the purpose of undertaking the construction and management itself, but it is pretty generally realized that there may be difficulty in getting the money in this way, and therefore it is also open to propositions for (1) a loan secured on the work undertaken, the construction to be by the lenders or otherwise under their control; or (2) a regular concession for construction and operation, the franchise to last preferably not longer than 20 years. No definite outline of the conditions prescribed has been formed, and a proposition that required harder conditions in certain ways would have a chance of acceptance on account of other favorable points, such, for example, as exceptional solidity and standing of the applicants and guaranties for prompt and satisfactory execution of contracts.

Vladivostok has a population, civil and military, of probably about 100,000, it being impossible to state the number accurately on account of the policy of secrecy maintained regarding military matters. The city is built on the shores of Golden Horn Bay and on the hills, which here begin to rise almost from the water's edge. To avoid ascending the hills too far, the city has extended itself along the shore, and is thus stretched out to a length of about 7 miles, disproportionate to its area; but there are a good many houses as high as 150′ above the sea, the streets leading to them being very steep.

WATERWORKS AND STREET RAILWAY.—The waterworks proposal presents some serious difficulties, as in order to secure a sufficient supply of water it will probably be necessary to go out about 35 miles to the Maike River and two or three pumping stations would be required to get the water over some of the intervening hills. It has also been suggested that the pipes be carried under Amur Bay to the Mangugai River, but the distance would be about the same and would include not less than 6 miles of pipe under the bay, which has an average depth of 42′ and is in some places as deep as 48′. It is estimated that from 550,000 to 800,000 galls. of water will be required daily. The severe winter, during which the ground freezes to a depth of about 5′ is an important factor to be considered. The naval station and the railway have waterworks of their own.

The street railway and electric lighting propositions are the most attractive at present. The great amount of traffic on the one or two principal streets would make it possible for a railway to serve a very large number of people with a comparatively short and simple system, the present idea being to construct a line from the eastern end of the town, along the main street to the railroad station and to the market. One branch line northward into the country on Aleutskaya or Kitaiskaya streets to First River, about 3 miles, would probably be also popular, as it would permit people to live in the suburbs of the town. A number of houses have been built in that direction already. There would probably be a good chance for a line around the bay as well. First and second class cars would probably be necessary here. Altogether about 8 miles of line should be constructed. The streets are for the most part wide enough to accommodate a double track.

As regards lighting, there are already a number of private plants, most of which supply other houses in their vicinity. This would be an important matter to be considered if concession were applied for. The city at present states that it will want for street lighting to begin with about 200 lights of 1,000 and 500 candlepower, and it is estimated that the private consumption will be from 5,000 to 7,000 lights of average candlepower. An increase would of course depend on the price and on the arrangements that could be made for limiting the private plants.

WHARVES, WAREHOUSES, AND MARKETS.—The wharves in Golden Horn Bay should have a frontage of about 3,500′. The warehouses are to be of two classes: Those for safe-keeping of goods for long periods, which should accommodate 129,000 tons; and those to shelter transit cargo, which should have a capacity of 261,300 tons—some to be built of brick, and some of steel and galvanized iron, or other cheap fireproof construction, according to the goods to be stored.

On Amur Bay simply a strong embankment will be necessary for about 1,750′ and a short breakwater, about 100′ long in comparatively shallow water; this is for the use of the small sailing craft in the local and coastwise trade.

A very large market will be required. Near the present building temporary booths covering 2 or 3 acres have been set up.

The main streets in immediate need of paving have an area of 490,000 sq. ft.

CAPITAL AND EXPERIENCE REQUIRED.—Judging from present appearances it would seem that if this enterprise were taken up with proper caution and tact by parties of whose bona fides there could be no doubt, and who could command the necessary capital or credit, a concession might be obtained for all or part of these works. If persons desired to make a loan to the city for the purpose, advantageous terms could probably be obtained, as the rate of interest commonly prevailing here is very high. The whole sum of $6,000,000 gold would not of course be needed at once, but would be spread over several years. It is understood that several proposals have already been made to the city, but on account of the lack of standing of the promoters, or because the conditions they propose are not satisfactory, they have not been accepted. It is most essential that parties applying for the concession should have large capital and experience to command the confidence of the municipality and of the central Government.

FUTURE OF THE CITY.—Of course such an investment would require confidence in the future of the city, on which subject interested parties must investigate and form their own opinions. Vladivostok is likely to continue to be at least as important as now and it is believed these works could be made to pay on the present basis. This leaves out of consideration the tremendous growth possible with the rich country back of this port. As has often been pointed out, while Vladivostok is not an "ice-free" port, by the use of an ice breaker ships are regularly enabled to enter and leave the harbor during the months of January and February when the ice forms, and as the railroad service develops a large transit trade will undoubtedly grow up here.

From the point of view of the general interests of American trade, it would be a tremendous advantage if such a foothold could be obtained in Siberia. These works would require a very large amount of imported material, and being a practical demonstration the start thus obtained would be very valuable.

Persons interested in this matter should communicate with the Mayor of the City of Vladivostok, and, if possible, should send a competent engineer who could make on the ground definite proposals for submission to the city. They must bear in mind that many difficulties will arise and that a satisfactory result can not be obtained without much patience, careful planning, and allowance for local conditions. The disadvantages may appear too great for some, but the various projects are said to be well worth an investigation.

RUSSIA PLANS TO REJUVENATE HER ORIENTAL TRADE

Passenger service by the Transsiberian Route having been resumed, first by one weekly express, and, since July 6th, by a second, travelers can now make the journey from Vladivostok to Moscow in 11½ days, with only one change of cars—at Irkutsk. The trains leave Vladivostok on Mondays and Fridays at 8:03 a. m., connecting with the weekly mail steamers of the Russian East Asiatic Company from China and Japan. Both first- and second-class cars give comfortable accommodations, the former being divided into compartments of two berths, while in the second-class compartments there are four berths. In the dining car attached to each train a table d'hôte dinner is served in the middle of the day for about 77 cents gold, while in the morning and evening meals may be ordered à la carte. The rates from Vladivostok, including cost of berths, are as follows, prices being given in gold:—

	1st-class	*2nd-class.*
Harbin	$22.20	$13.87
Irkutsk	70.57	44.88
Moscow	132.65	86.91
St. Petersburg	138.42	90.62

Only 54 lbs. of baggage may be checked free of charge by either first- or second-class passengers. For excess baggage the charge is $1.38 gold per 9 lbs. to Moscow, and $1.42 to St. Petersburg. Very large pieces can be carried in the sleeping cars, provided they are in the form of valises, etc.; and there are numerous racks in the corridors and elsewhere in which they can be kept out of the way. The baggage of western-bound passengers is examined at the station "Manchuria," and that of the east-bound passengers at Pogranichnaya, or, if desired, at Vladivostok. Hitherto these examinations have caused little inconvenience.

In this connection Russia's railroad movements in the Far East may be of interest. One of the most important of these is the announcement that the Ussuri Railroad, built and operated by the Russians, will be placed under the management of the Chinese Eastern Railway Company under terms not yet made public. It was realized that a much better and more economical through service could be given if these two links in the Transsiberian Route were under a single administration. Hitherto the 144 miles of the Ussuri Railroad, connecting the 920 miles of the Chinese Eastern Railway section across Manchuria with the sea, have been managed quite independently, making it difficult to organize any cheap and efficient through service, which both the railroads and the country need. An independent road like the Chinese Eastern may be better able to attract shippers and to foster promising new industries. As the whole Ussuri road is surrendered, the Chinese Eastern Railway gets also the line from Kikolsk to Habarovsk, 408 miles in length, which connects Vladivostok with the Amur River.

The construction of an Amur railroad between Stretensk and Habarovsk appears now to have been definitely placed on the Government's program for the near future. Telegraph reports state that the commission of the railway department recommends the immediate undertaking by the Government of the construction of the section from Stretensk, the present terminus of the Transbaikal branch line from Karymskaya, to the confluence of the Shikla and Argun rivers at Pokrofka, a distance of about 240 miles. It is estimated that this extension will cost about $22,000,000 gold.

Russia seems determined to do all in her power to recuperate her Oriental trade and to advance her commercial interests in the Far East. To this end she has been systematically at work granting subsidies to lines of steamships plying between her own ports and those of China, Japan, and other ports of Asia. Contracts have been made this year by the central Government for subsidized steamship services from Vladivostok to ports of China and Japan and also along the coast to Nikolaiefsk, Petropavlovsk, and way ports. The contract for the China and Japan lines is for one year and was given to the Russian East Asiatic Steamship Company, which is closely connected with the Danish East Asiatic Company. It provides: First, for a weekly mail and passenger steamer from Vladivostok to the Japanese port of Tsuruga, which lies to the southeast on the Japan Sea. This trip is scheduled to be made in 38 hours, and from Tsuruga, Kobé, and Osaka can be reached by train in eight hours, and Tokyo in 14 hours. Secondly for a weekly mail and passenger steamer from Vladivostok to Shanghai *via* Nagasaki and back by the same route. The voyage from Vladivostok to Nagasaki takes about 50 hours and the whole run to Shanghai about four days. Thirdly, for a freight and passenger line from Vladivostok to the ports of Gensan, Fusan, Nagasaki, Chemulpo, Shanghai, Chefoo, and Dalny and return, sailings to be once in two weeks.

It is provided that the speed of the mail and passenger steamers must be not less than 13 miles an hour, and of the freight and passenger steamers not less than 10 miles an hour, and it is stipulated that the sailings must be timed to give good connections with Russian and foreign railroad and steamship lines as the Russian Government may direct.

The chartering of foreign steamers is allowed. Mail steamers must have accommodations for 80 first-class and 300 third-class passengers and a cargo capacity of 1,500 tons. The freight steamers must accommodate 25 first-class and 200 third-class passengers and be able to carry 1,500 tons of cargo. Russian mails and mails from foreign ports for Russia are to be carried free, as well as the postal clerk to sort them, but the clerk is to be charged half the regular rate for his board. When so ordered by Russian diplomatic or consular officers, the vessels must carry free Russian subjects found abroad in a destitute condition, but not more than five on each steamer. Freight and passenger rates are not to exceed a maximum approved by the department of commerce and industry.

For delay in departure or arrival the mail steamers are subject to a fine of $25 an hour and the freight steamers to a fine of $12.50 an hour. If the delay is caused by inopportune acceptance of cargo or by touching at a port not indicated in the schedule, the fine is to be doubled. For leaving a port before the scheduled time a fine of $500 is to be imposed on the mail steamers and of $250 on the freight steamers. The fines for omitting the whole or part of a voyage are respectively $2,500 and $1,250 for the two classes of steamers. If delay is due to fogs, storms, lateness of express trains, or other reasonable causes, no fines are to be imposed. Moreover, if on account of late departure from one port the sailings from succeeding ports should also be delayed, only one fine is incurred, though efforts should be made to make up time lost.

If the company fails twice to complete a voyage, the Government may cancel the contract, transfer the business to another company, impose a fine of $25,000, and cancel all obligations of the Government to the company.

The Russian East Asiatic Steamship Company also has a contract for a coasting line between Vladivostok and Nikolaiefsk, with stops at six ports each way. Fourteen voyages must be made during the present season. A speed of 10 miles an hour and a cargo capacity of 1,000 tons are required for the vessels employed, which may be under a foreign flag. Maximum freight and passenger rates are fixed, and it is provided that troops shall be carried at half rates. Government mails and couriers are to be carried free. Fines are to be imposed of $125 for a day's delay in arrival or departure from a port, of $250 for leaving port before the appointed time or for omitting any port, of $750 for omitting a voyage or any part of it, and of double the amount for a second offense. If a steamer is held by the Government, $125 be paid for each day, Sundays excepted.

The subsidies to be paid to the Russian East Asiatic Steamship Company for all these services have been kept secret, but it is said that they amount to about $375,000 for the year.

A third contract has been made with the Russ Steamship Company for a line from Vladivostok to the ports of the Okhotsk and Bering seas, the Commodore Islands, and the Chukotsk Peninsula. During the present season four voyages are to be made, aggregating nearly 28,500 miles. The steamers must have a speed of not less than 8 miles an hour and a cargo capacity of not less than 1,000 tons. Foreign steamers may be used. The subsidy in this case is fixed at $107,500 for the four voyages, including one trip from Petropavlovsk to the mouth of the Anadir River. Delay in leaving port renders the company liable to a fine of $125 for each day lost, while the Government is obliged to pay the company the same amount if it holds a steamer. For failure to call at an appointed port the company is to be fined $2,500, while if a ship does not return to Vladivostok within five days of the scheduled date a fine of $125 is incurred for every succeeding day of delay. Government mails and couriers are to be carried free, and maximum rates are fixed for freight and passenger charges.

TRANSSIBERIAN RAILWAY

HONGKONG AND SHANGHAI BANK

The half-yearly report and balance-sheet of the Hongkong and Shanghai Banking Corporation again discloses a highly satisfactory state of affairs. An examination of the detailed figures exhibits the strength of the position, which must be gratifying to the directors and manager. The silver reserve fund now stands at considerably over $10,000,000. A dividend is declared of £1.15s. sterling per share, while a balance of $1,712,242 is carried forward to next account.

PROBABLE ORIGIN AND COURSE OF THE HONGKONG TYPHOON

(By the Rev. José Algué, S. J., Director of the Philippine Weather Bureau)

In a letter from Zikawei dated September 22d, 1906, and published in the *North-China Daily News*, we read the following concerning this typhoon:—

The storm was a typhoon with a narrow diameter, but regularly shaped—somewhat of the type of one which took the coast between Amoy and Swatow during the night of the 9th instant. The first signs of the new disturbance were once more given by the Japanese observations in the islands east of Formosa, the importance of which can not be overestimated. With these and the telegrams from Formosa we were enabled to send the first warning: "Typhoon south of Meiaco-Sima" to put ships leaving for the south upon their guard. This was cabled to the China Coast semaphores on Saturday, 15th, at 11:30 a. m.

This statement of Zikawei Observatory has proven to be correct from the observations of our stations at Santo Domingo de Basco and Aparri. It is very probable that this storm came from the Pacific in a regular way. Two depressions were slightly felt in our station of Guam in the first half of September: one on the afternoon of the 8th. The barometer gave the lowest reading for the month (754.92 mm.) at 2 p. m. this day, and the wind veered from the west to the SE. through the south. Granted now that some depression crossed at 200 miles north of Guam at about 11 a. m. of the 8th, it may be reasonably supposed that this was the one which on the 15th reached Santo Domingo with an average velocity of some 8 nautical miles an hour, as the distance from Guam to Santo Domingo is nearly 1,400 miles. This supposition may be strengthened by the fact that in our easternmost station, Borongan, in Samar Island, which is entirely open to the Pacific, the movement of the lower clouds showed evidently the passage of a depression through its north. In fact, the lower clouds in this station were observed coming from the NW. during the afternoon of the 11th, from the W. at 2 p. m. of the 12th, from the WSW. at 2 p. m. of the 13th, from the WSW. at 2 p. m. of the 14th, and finally from the SW. at 2 p. m. of the 15th. One inch of rain was collected at this station on the 14th. The clouds were observed coming from WSW. on the 12th and the 14th in Legaspi, the most eastern station of Luzon. But, however this may be, it is a matter of fact that a regularly shaped cyclone crossed north of our station of Santo Domingo in the afternoon of the 15th.

Santo Domingo Meteorological Observations.—It appears from observations taken at Santo Domingo (latitude, 20° 28′ north; longitude, 121° 59′ east):—

(*a*) That a typhoon crossed close through the north of that station from 3 to 4 p. m. of the 15th; the barometric minimum was 743.98 millimeters at 2:30 p. m., that of Hongkong 739.89 millimeters at 9:35 a. m. of the 18th.

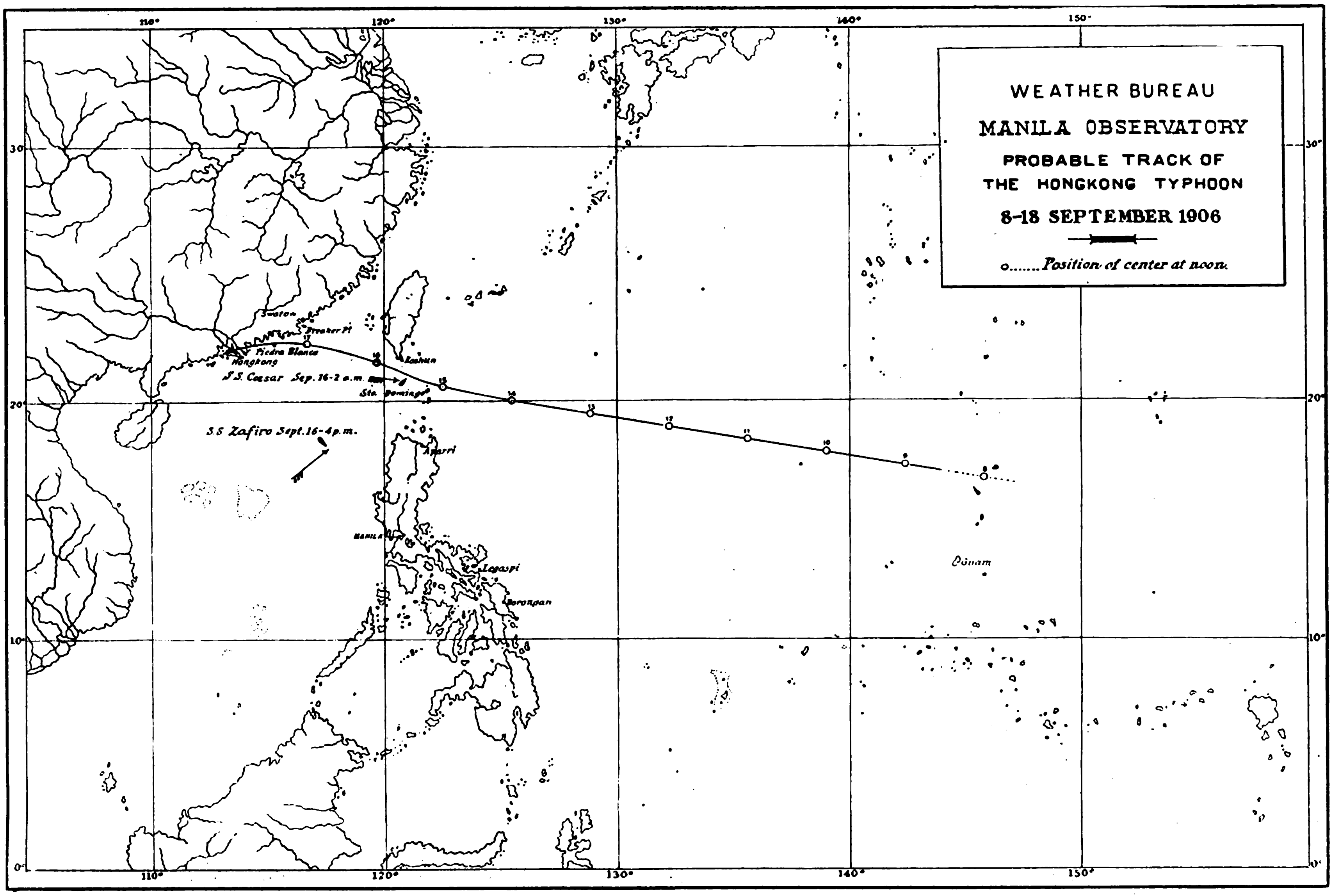
(*b*) It further appears from the shifting of the clouds from NW. to SSW. and of the wind from NNW. to S. that in the afternoon of the 15th the center moved in the direction NW. by W.

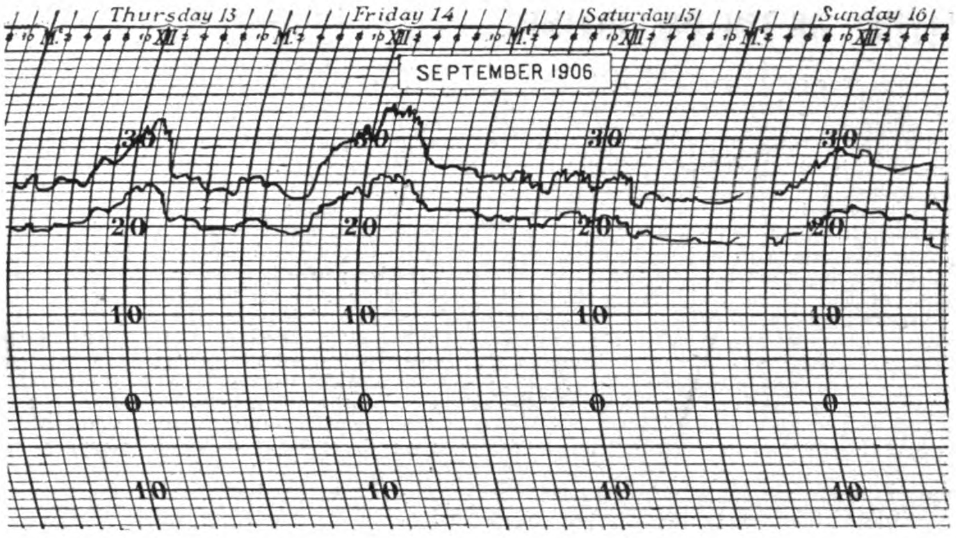
(*c*) It is also remarkable that there was a decided falling of the temperature during the passage of the center from 10 a. m. to 10 p. m., and an increase of the vapor tension from 6 a. m. to 4 p. m. The fall of the temperature between 3 and 4 p. m. is very striking in the record of the psychrograph.

(*d*) I call attention to another fact; that is, from midnight the barometer was decidedly falling up to 10 a. m., and therefore the semi-oscillation was lost; or, in other words, the pressure was falling since 3 a. m. instead of rising. This alteration of the barometric oscillation is always a sign of an impending atmospheric disturbance.

Simultaneous Station Observations.—If we compare the simultaneous observations of Koshun (South Cape), Santo Domingo, and Aparri, they will show (*a*) that the body of this typhoon was rather small, as at 6 a. m. of the 15th in Koshun and in Aparri neither the winds nor the barometer indicated the presence of any disturbance; only the clouds in Aparri indicated the crossing of the typhoon, as they moved from the N. on the 14th and shifted SW. on the 15th in the afternoon; (*b*) as the winds were stronger at Koshun than at Santo Domingo, we must conclude that the storm, as it advanced through the Bashi Channel into the China Sea, increased in strength inasmuch as Santo Domingo has been closer to the center than Koshun; (*c*) the winds at Koshun show also that the center moved to the NW. by W., as in the afternoon of the 16th it was nearly due W. of South Cape. This is also confirmed by the report of the captain of the steamer *Océanien*, who experienced the passage of the center through his south at a distance when the ship was not very far from Breaker Point.

Center Makes a Curve.—The center then made quite a curve from Santo Domingo to Hongkong, a distance of nearly 530 miles, as shown on the accompanying chart. Then, according to the birograms from Santo Domingo to Hongkong, this track was run in 66 hours, from 4 p. m. of the 15th to 10 a. m. of the 18th, or with an average velocity of 8 miles an hour.





CURVES TRACED BY THE PSYCHROGRAPH AT SANTO DOMINGO DE BASCO (BATANES ISLANDS)

The steamship *Zafiro*, bound to Manila, and which left Hongkong on the afternoon of the 15th, experienced the effect of this storm when in parallel 18° 20′ north and in the meridian 117° 17′ at 4 p. m. of the 16th; the barometric reading was 755.73 millimeters and the wind from SW. increasing in force until midnight; the center was passing through the NNE. of the ship at 4 p. m. at a distance of about 240 miles, which may be considered the shortest distance from the vortex to the ship. This fact confirms the statement that the gradient near the center was considerably sharp and the low isobars of very small diameter.

Another report confirms also the inclination of the vortex to the NW. and its movement parallel to it, or to W. by S. The British steamer *Kneichow* reports:—

Fine weather, NE. winds, and smooth sea to Swatow. On the morning of the 18th, from 1 a. m. to 6 a. m., experienced furious typhoon to ESE. of Pedra-Branca Islet. At 3:45 a. m. center of typhoon passed nearly over ship. Sustained no damage. Lowest barometer reading 3:50 a. m., 740.40 millimeters.

As this reading is almost as low as the minimum at Hongkong, we may take it for granted that the center passed very close to the steamer at about 3:50 a. m. of the 18th. The distance from Pedra-Branca to Hongkong is about 70 miles. The steamer bound to Hongkong had probably traveled westward or west-southwestward since 1 a. m. and when the center met her she was probably some 10 or 20 miles west of the islet, or some 50 miles from Hongkong. The vortex would then have spent six hours to travel this distance, which gives a velocity of 8.3 miles per hour. The captain of the S. S. *Kneichow* further reports that from 4 to 5 p. m. of the 18th he stopped three times to rescue fishermen and families in vicinity of Ninepins, rescued 26 persons, and found the sea literally strewn with wreckage in every direction.

All these facts show how accurate was the warning sent out by the Zikawei Observatory on the morning of the 15th about this typhoon, as I intended to prove. Other warnings were given by the Zikawei Observatory, which will be seen in the following paragraphs of the letter above mentioned:—

The direction of the center could not yet be surmised. The bulletin printed the following day, the 16th, noted that the movement was bringing the center toward the south end of Formosa. At the South Cape the north breeze had freshened to force 6, and a north gale, force 8, was setting in at the Pescadores. About noon a new signal was sent out telling that the cyclone was nearing the east shores of the island, with a slow motion.

All the stations seem to have been too far from the central vortex to determine more accurately its direction, though it was clearly moving toward Formosa and China. In the afternoon we had to forecast rough weather in the channel, with strong north winds along the coast north of it, up to the Chusan.

The worst of the cyclone was not in the center of the isobars, which are shown surrounding Formosa, on the Zikawei daily charts, but in the southernmost part, near the Bashi Channel.

Two points seem quite clear: *First*, that the vortex, while advancing westward, was deepening more and more; indeed, though it did not pass so far from the South Cape as from the Pescadores, yet the fall of the glass at Hokoto (Pescadores) was heavier than at the other station (Koshun). The next day, still at Swatow, the minimum was lower, though at still greater distance. *Second*, that the storm which first traveled to WNW. (roughly) seems to have deflected little by little to W. or possibly WSW. as it approached the China coast. The reason may have been the high reading then prevailing in Siberia and Mongolia, which were progressively encroaching over the Yangstze Valley. From the 15th to the 16th the barometer had risen from 30.24 to 30.35 at Troizkossavsk (south of Lake Baikal).

As a consequence, the pressure went up from the 16th to the 17th, from 29.76 to 30.04 at Shanghai, and to 30 at Hankow and Tchand. This served to make the gradient steeper and to increase the violence of the vortex.

ZIKAWEI WARNINGS.—A new confirmation of both the Zikawei warnings and the probable track of the typhoon we publish herewith may be found in a second letter published by the Zikawei Observatory. (Supplement to the Zikawei daily weather chart, No. 92.) The observations published in said letter give one more point of reference for the tracing of the trajectory, which lies about 80 miles WNW. of Santo Domingo.

The United States auxiliary transport *Caesar* [says the letter] had left Cavite (Bay of Manila) for Shanghai on the 13th. The ship's barometer, a first-class one, was showing practically the same pressure as that of the standard of Manila Observatory.

All went on smoothly until the evening of the 14th. At 10 p. m. a light NNE. breeze arose but soon abated, the sky became overcast and threatening. At midnight the wind again blew from NNE., then backed, slowly, to NW. at 3 a. m. (15th) and WNW. at 8 a. m. Afterwards the wind blew with short squalls, which gradually increased from force 2 to 4. At dawn a very distinct north swell was noted.

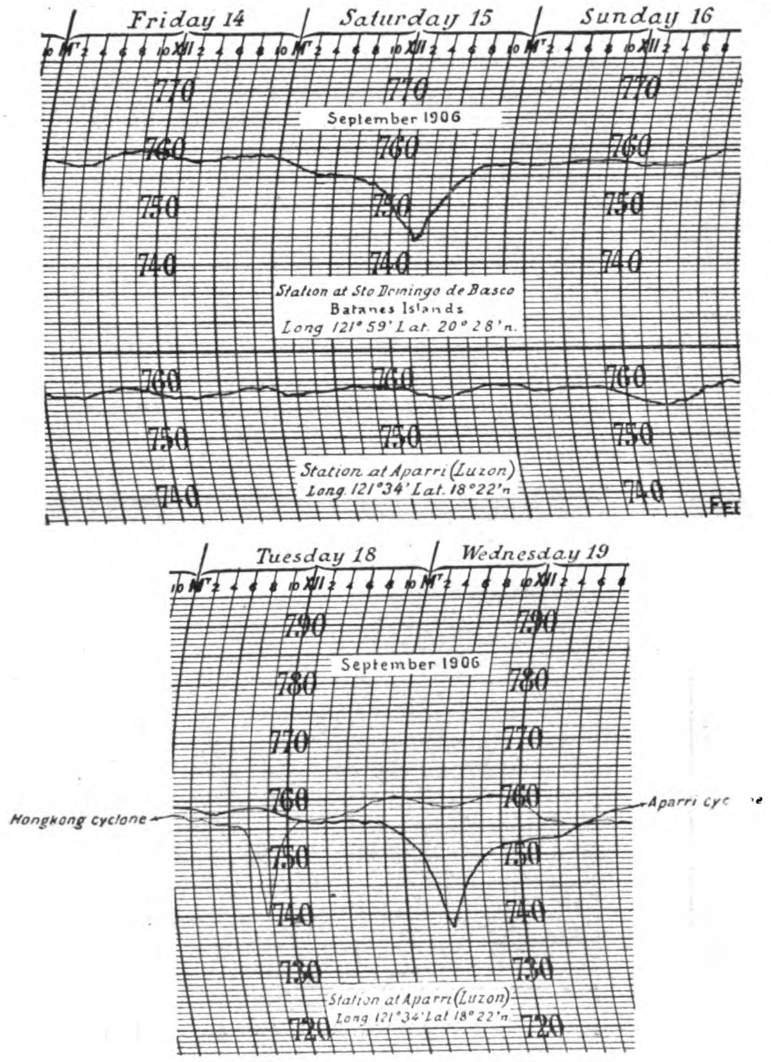
These two remarks we insist upon, for, slight as they were, they undoubtedly gave the earliest signs of the coming typhoon. This shows how long in advance a careful navigator can be put on his guard against an approaching danger. The report signals during the morning and a part of the afternoon, a sky heavily overcast to the eastward, bright and sunny over the west horizon—this was the typhoon bank or mantle well known to the naivgators.

On the 15th at noon the ship was found in latitude 19° 53′ N. and longitude 120° 20′ E., nearly 84 miles north of Cape Bojeador (Luzon). At 4 p. m. the wind was steady from northwest, freshened to force 7. The barometric tide could still be observed, but at 8 p. m. the mercury began to fall with oscillations estimated about 0.03; the wind freshened and veered to NNW. She was forced to steer southwest, to go away from the center.

At midnight she was 40 miles N. of her noon position, *viz.* 82 miles west of Batan Island. On the morning of the 17th a heavy west swell was observed along the shore of the South Cape of Formosa. The reporter says that the continuous rain which fell from the evening of the 15th to the 16th was the heaviest downpour he has experienced in his life.

The experience of the *Caesar* clearly shows that the center passed between that ship and the South Cape of Formosa on September 16th, shortly after 1 a. m.

(*Continued on page 199.*)

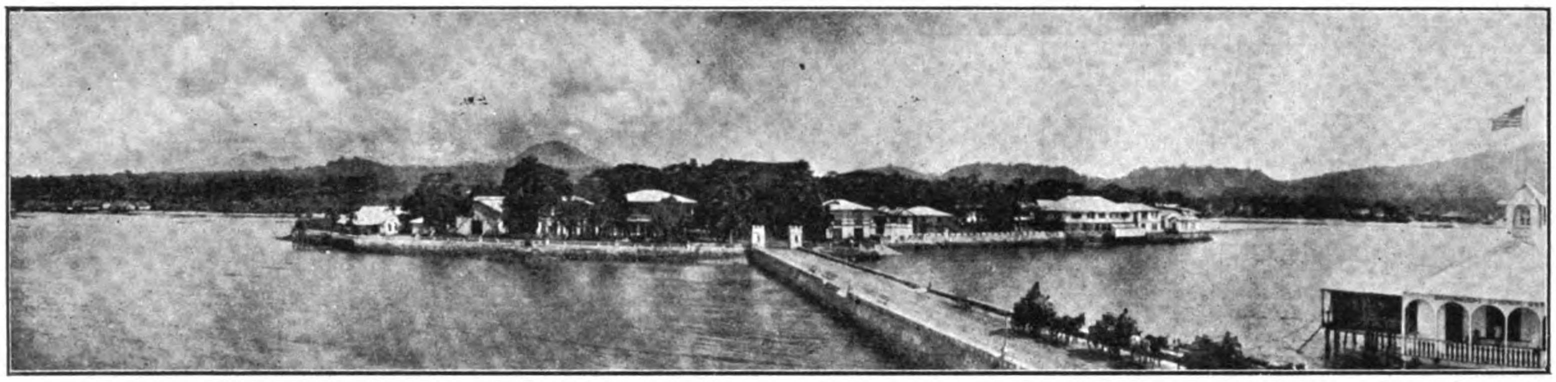


CURVES TRACED BY BAROGRAPH AT SANTO DOMINGO AND AT APARRI (LUZON)

PEARLING INDUSTRY IN THE SULU WATERS OF THE PHILIPPINES

The legislative council of the Moro Province, Philippine Islands, has passed an act amending the pearl-fishing law of the province, by striking out the clause requiring vessels engaged in the trade to be built in the United States or in the Philippines. As amended the section reads:

"No license to engage in the fishing for or the gathering of shells of marine *mollusca* * * * shall be issued to any vessel not wholly owned by citizens of the United States, honorably-discharged soldiers of the army or sailors of the navy of the United States; natives of the Philippine Islands, or persons who have, under and by virtue of the Treaty of Paris, acquired the political rights of natives of the Philippine Islands."

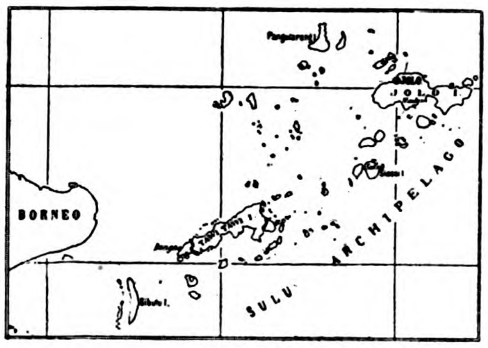


PICTURESQUE WALLED CITY OF JOLO, HEADQUARTERS OF THE SULU PEARLING INDUSTRY

SULU PEARL FISHERIES.—Fishing for mother-of-pearl shells and, incidentally, for pearls, is carried on to a considerable extent in the waters of the Sulu Archipelago, the town of Jolo being rated one of the foremost pearling ports of the world. The Chinese have large interests in the industry, and there are Americans, Spaniards, Filipinos, Ceylonese, Singalese and Arabs in it as well. All Moros are more or less interested, and a considerable percentage of the Sulu Archipelago actually gains a livelihood by engaging in this perilous business. It may be said that the entire population of Jolo dabbles in pearls. Curbstone traders are numerous, and they have to offer a tremendous variety of sizes and shapes, colors and varieties. The person who has the least instinct of the trader can not resist the temptation to buy and pit his judgment against that of the seller. The industry is said to be very profitable, and it is believed to be capable of great enlargement. The investment of comparatively small capital will, it is said, yield large returns under intelligent and businesslike management.

A MYSTERIOUS INDUSTRY.—Pearling is a mysterious industry. Thousands of lives are risked each year right here in the Sulu Archipelago, in delving into ocean depths for the great round-shell bivalve which occasionally contains a pearl with thousands. Because of the great risk involved, and the possible fortune to be gained, the industry has a fascination scarcely to be resisted by those who have once undertaken it. Because of the great variety of people who search for pearls, the vast area of the hunting-grounds, the centuries-old customs of the Moros, and the special laws covering the industry, no reliable figures can be obtained that will approximate the profits. The industry is therefore all the more mysterious.

Pearling is a game of hazard for high stakes. The pearler must risk his life, must brave the sea, and go prepared to fight for his rights, with savage men; and he must pay the taxes and divide the profits with the shrewd traders rom Ceylon and Singapore.



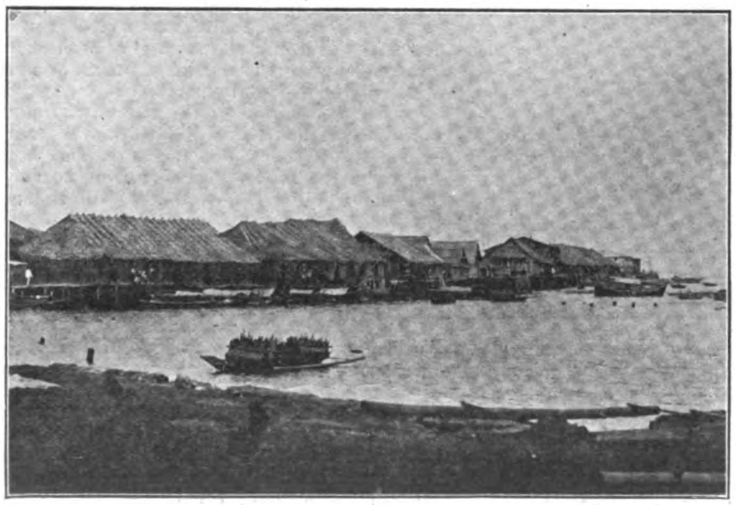
PEARLING GROUNDS IN THE SULU SEA

SOMETIMES FORTUNE SMILES.—Three years ago a single pearl was marketed in the Celebes for ₱36,000. It came from the Sulu Sea. During the following year a pearl brought to Jolo was sold in Singapore for ₱12,000, and last year one sold for ₱9,730. Such finds rarely come to public notice. Shrewd traders are always on hand to snatch them away from the ignorant diver, and the treasure is first exposed for sale on the open market in Paris or London or a Dutch port. Probably the dealer who places it on the market does not care to know its origin.

The greatest pearl ever claimed from the Sulu Sea, however, was recently marketed in Singapore for ₱60,000. It is the size of a marble, perfectly round and flawless, and of exquisite color. The gem was found by a poor Moro fisherman, seized by the Sultan of Sulu and marketed. The District Governor of Jolo learned of the transaction and saw that the fisherman received the justice due to him through court procedure. The sultan was compelled to disgorge the pearl, and then the District Governor commissioned the Jolo Trading Company to sell it for the benefit of the finder, which was done as above stated, the company receiving a commission of 10 per cent.

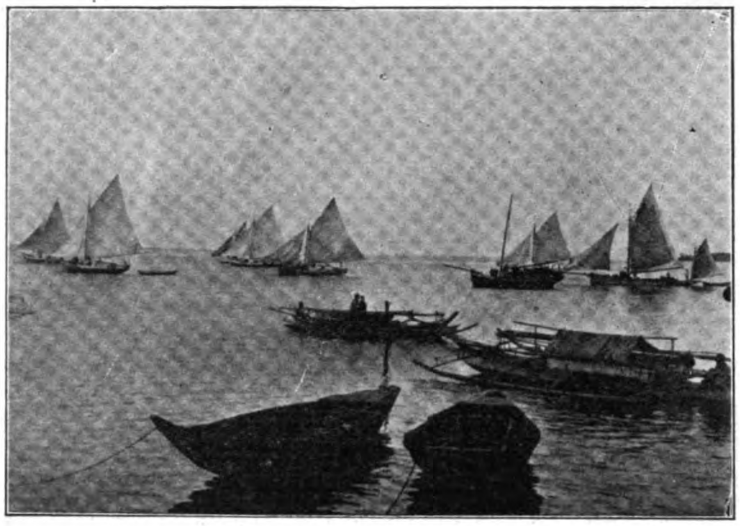
Thousands of pearls of less value are found every year, ranging in price from ₱0.50 to ₱3,000. Sometimes a rough-looking pearl, by the process of *skinning*, is reduced to a smaller and more perfect gem, and its value enhanced a hundred fold.

MOTHER-OF-PEARL.—Pearl shells are themselves very valuable in the markets of the world. These shells are plentiful in Sulu waters. At the present time the monthly shipment of mother-of-pearl from Jolo amounts to more than 600 piculs, valued in the local market at ₱80 per picul. As it does not take more than 30 to 35 pairs of shells to make a picul, a good *gathering* is very profitable. Manila is becoming a good market for mother-of-pearl, where there is now in operation a very profitabe factory for the manufacture of buttons, knife-handles, etc., and mother-of-pearl novelties of every description. Singapore is also a good market. A large pair of shells will weigh 10 to

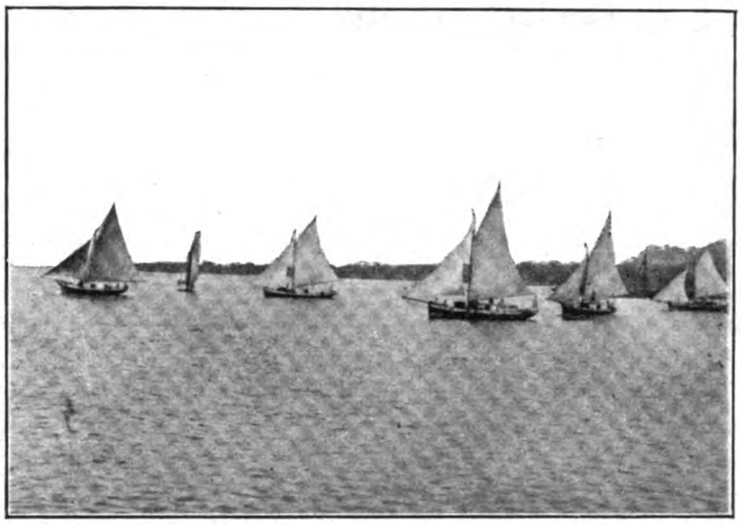


MOTHER-OF-PEARL MARKET AT JOLO

STREET WHERE PEARL BROKERS OPERATE



PEARLING FLEET CLEARING ANCHORAGE AT JOLO



FLEET AT THE PEARLING GROUNDS

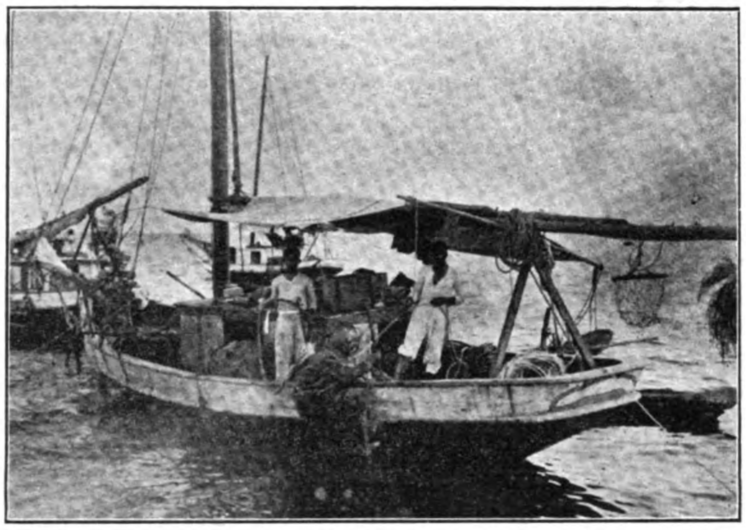
12 lbs. The finding of pearls is merely incidental to the larger industry.

METHODS OF FISHING.—In fishing for mother-of-pearl shells down in Sulu waters the months of April, May and June, and November, December and January are the most favorable; and practically none is done in any other period of the year. These seasons are determined by the character of the winds, the calm weather being an essential to success. Pearls are found mostly in water about 50 fathoms deep. At the present it is estimated that more than 2,000 boats have been equipped and made ready for the beginning of the fall fishing which will be inaugurated before November 5th.

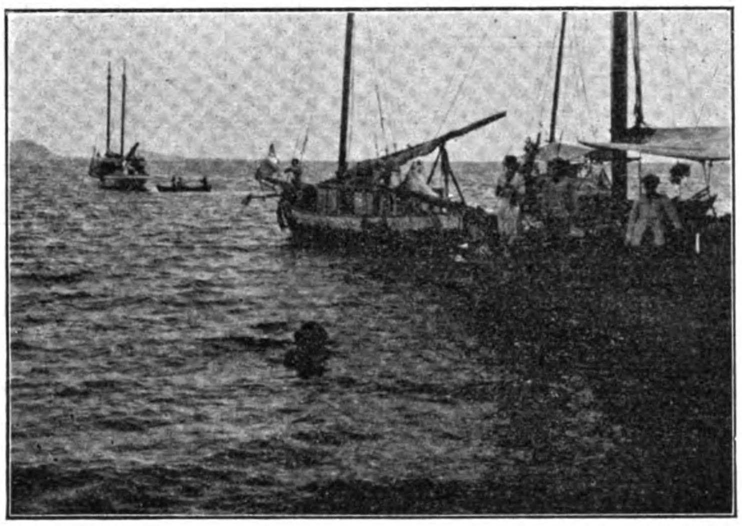
The apparatus used for shallow-water dregging consists of a rake, the teeth of which are very long, thick and curved; the handle being comparatively short. The whole apparatus distinctly resembles a cradle, such as was used in the United States for cutting grain 30 to 40 years ago, and if suspended by the end of the handle will take a horizontal position. To the end of the handle is attached a piece of *bejuco* (rattan) about $\frac{1}{2}$ to $\frac{3}{4}$″ thick. At the head of the handle is attached another piece of rattan about half as thick as that at the other end. In length each piece of rattan is about $1\frac{1}{2}$ times the depth of the water in which they fish.

One of these apparatus is dropped overboard and the boats are paddled with the tide. When it is felt that the rake is full, it is lighted by means of the thick length of the rattan, and the contents emptied into the boat. Should the

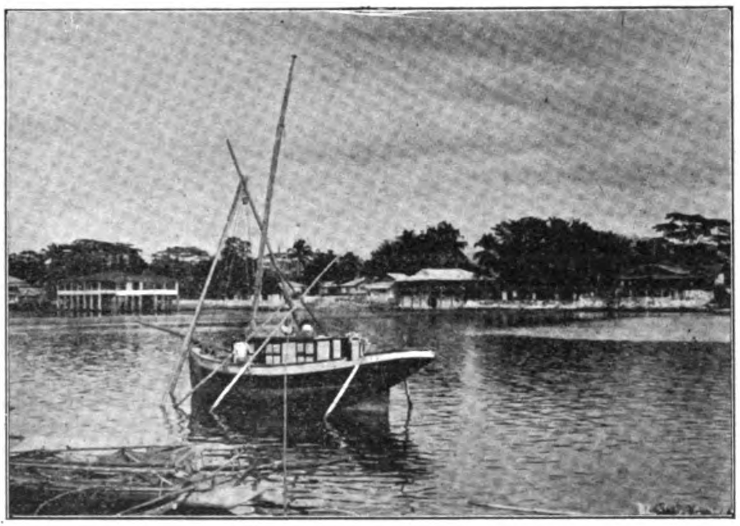
(Continued on page 202.)



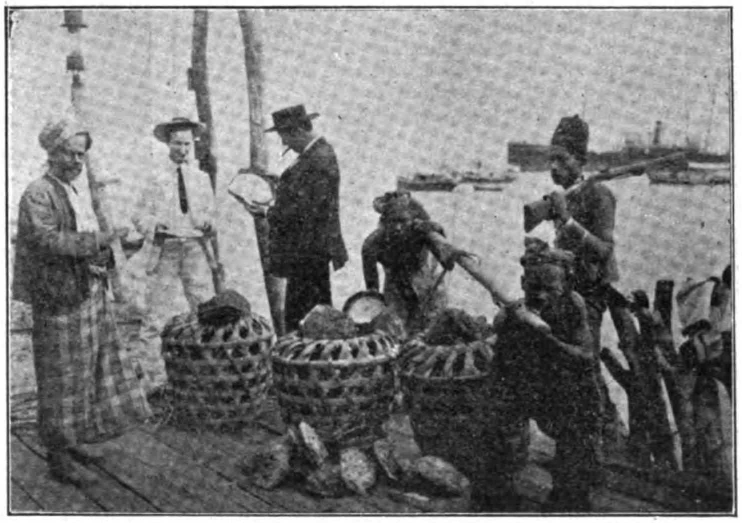
DEEP-WATER DIVER GOING DOWN INTO THE WATER AFTER SHELLS



DIVER COMING UP OUT OF THE WATER



PEARLING BALANDRA, OR SLOOP

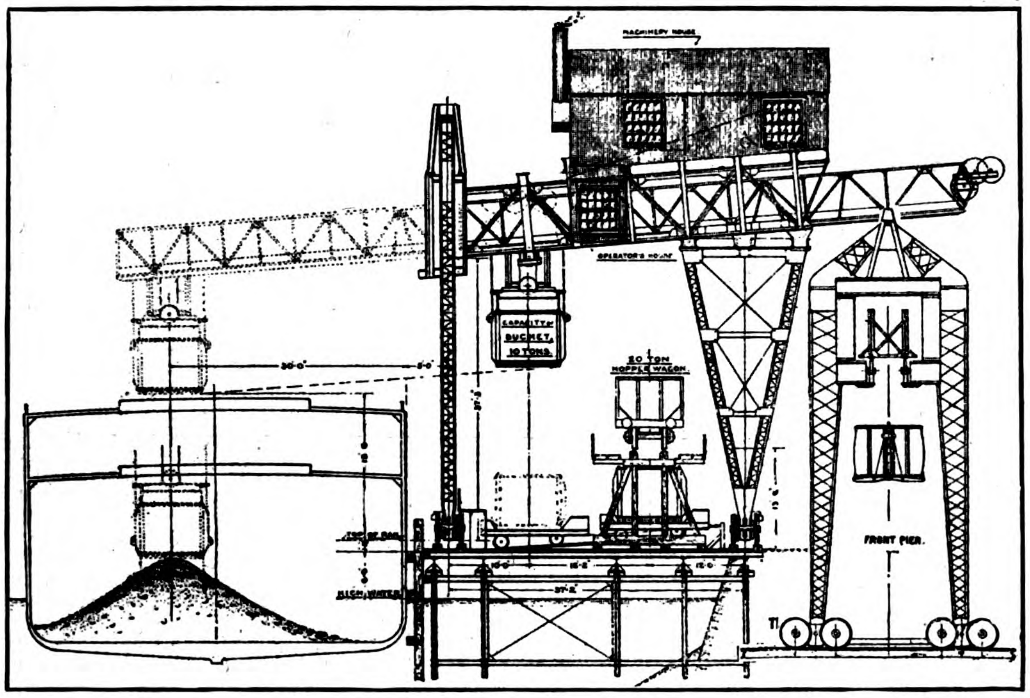


ARAB MERCHANT LANDING PEARL SHELLS AT THE MARKET

COAL-CONVEYING PLANT, JAPAN

The Brown Hoist Company of Cleveland, U. S. A., has recently installed one of its patent coal-conveying plants for the sea-borne trade at the Japanese port of Wakamatsu, for the Kiushiu Railway. It comprises two hoisting and conveying machines, each 37′2″ span, with telescopic extension arm at the front pier, or vessel end, of 43′6″. The machines are constructed almost entirely of iron and steel.

Each double-cylinder hoisting engine travels its machine on its tracks upon the dock, when



COAL-CONVEYING PLANT AT PORT OF WAKAMATSU

n ordinary use, at from 400 to 600′ per minute, and will hoist the 10-ton load in the tub at the rate of about 150′ per minute. The motion of the tub, or ram, out over the vessel, which works by gravity in that direction, is from 300 to 600′ per minute. The lowering of the load over the vessel is by gravity, and is controlled by a brake and foot lever. Returning the tub with ram, back to the place of starting, is from 300 to 600′ per minute.

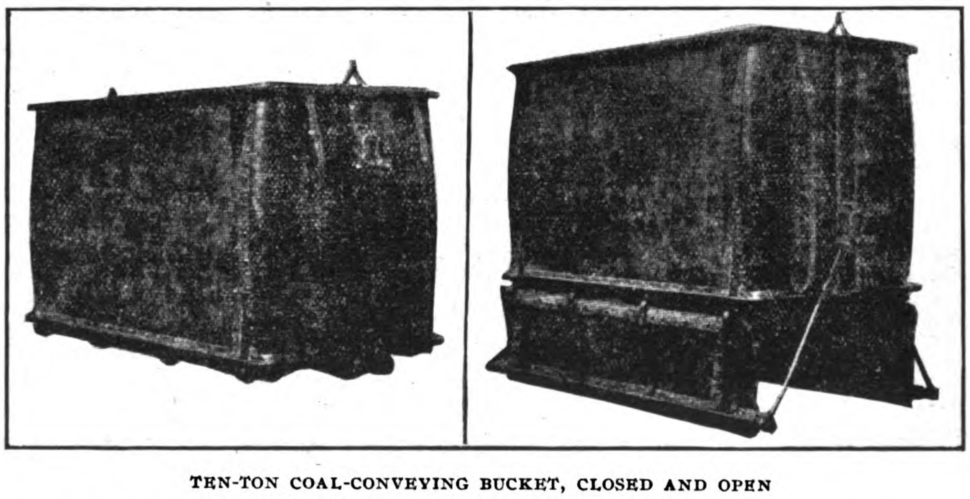
Both machines have a built-up lattice girder bridge, supported at either end by the front and rear piers, this bridge having to support the extension arm. Each of the machines is supported at the front end on a single pier or shear, and at the rear end similarly. The front pier is of sufficient height that the bottom of the bucket at the center of the shear rail is 21′ above rail-level. Both piers are constructed of iron and steel, and the whole is mounted on four equalizing trucks with suitable and convenient gears to move them along the rails and tracks on which they are mounted.

Each machine is provided with a telescopic extension ram, so arranged that it can be moved out over the vessel by gravity and returned back to the place of starting, by steam power. The moving gear from the front and back piers is arranged to be operated by steam power. All wheel axlebearings are bronze bushed, and are provided with convenient oil chambers with lids.

Two hoisting engines are in the equipment, each with two cylinders 13″ diameter, 15″ stroke, mounted on the same bed with patent band friction hoisting drums and band friction pulling drums for the ram and conveying machine. Each is also equipped with band friction clutch gearing which, through its shaft and gear, connects to the truck wheels on which the whole machine is mounted, and propels the whole structure along the tracks, the drums being of sufficient face for the grooves on same to hold the rope required for operating the machines without overwinding.

Two special cylinders are provided, so constructed and connected to operating ropes that the special coal tube may be emptied at any time and in any position. Two special locomotive-type horizontal boilers, of ample capacity for the maximum work they are to do, are also installed. Two special pumps are mounted in the lower part of the back piers for the purpose of pumping water from a water-tank car, and filling the special tank mounted on the back piers, for feeding the boilers.

Twelve special automatic coal tubs, made of iron and steel, have been supplied, with inside dimensions approximately 8′ long by 6′ 6″ high, by 8′ wide, equivalent to a capacity of about 10 gross tons of coal when completely filled. Each tub is equipped with its operating doors and carrying loops, safety guards, and is bound around the top and bottom by a stiff steel beam or rail, with the sides arranged in



TEN-TON COAL-CONVEYING BUCKET, CLOSED AND OPEN

the curve to throw them in tension and prevent buckling and getting out of their normal shape. The ends are flanged at their sides to a round edge, to which the side plates are riveted, and these ends are stiffened by Z-bars and guards.

For operating on the gravity track twelve tub-handling cars are provided. The cars are built entirely of iron and steel except the footway on which the man stands to hook on the tub, and the floor on top of the steel frame of the car on which the tub rests, which is also of wood.

MORO PROVINCE OF THE PHILIPPINES

In a recent issue of *The Sun* (New York), appears the following contribution from the pen of Mr. W. J. Ballard, of Los Angeles, Cal., one of the best known newspaper correspondents in the United States:—

From THE FAR EASTERN REVIEW of Manila, we learn that the American occupation and government of Moro Province, Island of Mindanao, Philippine Islands, is producing good results. For centuries the Moros have been a people apart unto themselves in race and customs.

The policy of the American administration of the island has been to aid, to the extent of its power, the development of agriculture, commerce, fisheries and the timber industry; to furnish cheap transportation to producers, and to give equal opportunities to all, regardless of color or position in life. When the Americans took hold of Moro Province two years ago, slave raiding was rampant, and every form of lawlessness and outlawry existed, especially in the Island of Jolo, in the upper reaches of the Cotabato Valley, and in the country about Lake Lanao. Many Christian Filipinos had been carried into slavery, their settlements and *rancherias* captured and ransacked and their women carried off.

After two years of active operations against the fighting Moros, the authority of the United States Government has been recognized, and for the first time in their history the Moros are paying taxes to a Government outside of their own tribal relations. The people are handled (as in India) through their native chiefs, who in turn have native deputies. The head men report to the District Governor. Special agents of the five District Governors are placed among the wild people, to gain their confidence and good will, to teach them how to trade, and the value of observing law and order.

To encourage trade, exchanges or trade stations have been established at the instance of Captain John F. Finley, United States Army, Governor of Zamboanga. To these stations Moros and other non-Christians bring their products and secure ready sales for them. People are coming in to trade who never before saw men meet without fighting, and who never saw the seacoast. The Moros prohibited until recently any fishing or seacoast traffic by the inland natives. They held it all for themselves, and lived on the profits of the labor of other tribes. That is chiefly the reason why they resisted American occupation and the opening of the country to the death Inland natives now come and go as they please, buy and sell as they please, getting and paying the current prices in open market.

The Mohammedan religion has not been interfered with, nor any too drastic reforms established, except in the suppression of slavery, human sacrifice and the autocratic powers of the datus.

Public schools have been established in all the principal towns; some American teachers have been employed, and many native assistants. The schools are well attended, and the children are making good progress. Chil-

dren of many tribes, speaking different languages, are now started on the road toward learning English. For the Moro children text books written in Arabic and English characters had to be prepared. Native teachers are learning English at a normal school in Zamboanga. In the same city there is also an industrial school for Moros and Filipinos.

Public works in Mindanao have been limited only by the funds available. Wharves and landing places, passable roads and trails and many bridges have been built; also many schoolhouses, as well as district and provincial offices. In Zamboanga a provincial building of concrete and native hard woods is under construction; it will be the best and most permanent type of building put up in the islands since American occupation began. The Moro Province is solvent, though its revenue is small.

The enormous Island of Mindanao is practically covered with forests of valuable woods. Its undeveloped wealth is very great; especially in timber and jungle products, such as crude gutta percha rubber, cinnamon and allspice. Many rubber plantations are being started. Through the south and east coasts of the province large amounts of hemp are being cultivated. The product is of excellent quality and the crop large. Cacao (cocoa) also does very well, and is quite a profitable cropto handle.

The success of the cocoanut industry in Mindanao is well known. It is one of the principal sources of revenue of the province. Planters are putting in a great many cocoanut trees everywhere. Rice and other native food products thrive generally in all sections of the province.

Coal is present in many places, but cannot yet be profitably worked. There is an unlimited number of mango trees, which have a bark most valuable for tanning and dyeing. This industry, so profitable in the Malay Peninsula and parts of Borneo, is as yet entirely undeveloped in Mindanao. The sea swarms with many kinds of valuable fish, and the pearl fisheries of the Sulu Sea are extensive and profitable. The Moro had this industry corralled but it is now open to all who comply with the legal requirements. Sugar grows well, and large areas are especially adapted to its growth. The Cotabato Valley is preëminently so. Philippine sugar should come into the United States free, and the American money go into American owned sugar mills over there, fitted with American made machinery and directed by American executives. The present situation is all wrong.

Coffee of good quality, about 100 tons a year, is produced in the small section around Lake Lanao. To get cheap and regular freights the province of Moro has subsidized one steamer ("the children are wiser than the fathers, etc.") and will probably subsidize another, with a fixed agreement as to rates of freight and passage.

The Moro is a ready worker, anxious always to make money, and strong and energetic. He is perhaps the best laborer found in the Philippines. The climate is healthy, and suitable to white people.

The Far Eastern Review closes by saying: "In comparison with other countries in the Far East, it is believed that the Philippines, and especially the southern Philippines, as represented by the Moro Province, offer the best field for white settlers at present in the East. The general policy of the Government of Moro Province (as of all the Philippine provinces) is to give all its people security of life and property, its children an opportunity to obtain an average education, and to all its people regardless of color an opportunity to succeed in accordance with their ability."

BRIGHT GOLD-MINING PROSPECTS IN THE PROVINCE OF BENGUET, P. I.

(Concluded from page 191.)

that the lay of the country is such that all lodes and ledges may be tunneled, doing away with the expensive shaft, and that in consequence the drainage will be perfect and not the expensive annoyance so almost universally found in these ventures. The tunneling under his charge and direction has reached 220′.

In this same district along the Antimok River is located the Bua Mining Company. This company is organized with Manila capital on a basis of ₱200,000, though with almost unlimited backing. This corporation has possession of 20 claims in which it has already constructed between 2,000 and 3,000′ of tunnel and shaft. In its work it has developed eight paying loads assaying from $6 to $40 to the ton and finding intervening streaks of high grade ore. This company's plans for the coming year contemplate the construction of a large milling plant, as it is thoroughly convinced of the richness of its prospects.

On these claims are clear indications of past native work showing by the Igorot tunnels that gold was taken from here under the Spanish Government, probably a century ago. Throughout this region and in fact throughout the entire province sufficient water for milling power is readily found.

Also in this same district and on the same river are the pioneer miners, Clyde and Peterson. I may say these are also among the pioneer *prospectors* of this country, but I speak of them as pioneer miners because they are the first who with machinery extracted gold from the dirt of Benguet. These men made their own mill with its stamp, and with their own hands put it together again every time it would fall apart. It was a crude, flimsy piece of machinery with amalgamating plate so small that it would ordinarily be considered impracticable. Yet with their indomitable energy and perseverance these men worked about 300 tons of ore through this little mill extracting about $5 a ton and saving perhaps 60 per cent of the gold in the ore, the remaining 50 per cent being left on the dump. I am not endeavoring to promote the mill as constructed by Peterson and Clyde, but state these particulars as proof of the richness of their claims, when with such crude machinery they can accomplish so much.

Opposite this valley but within two miles of these workings is the mine of Mr. James Kelly. This prospect carries with it, as shown by its assays in the lode in which he has most developed both copper and gold averaging between $18 and $20 to the ton, although he is developing another lode on the same claim that has no indication of any other mineral than gold therein. He has between 700 and 800′ of underground work done and finds the richest ore so far about 200′ below the surface, all being graded tunnel work.

On the old Benguet-rd, perhaps five miles in an air line from the Kelly workings, is the Copper King Mine, George A. Mead principal. The assays from this mine show gold, silver, copper and lead, with an average value of $20 per ton, although herein have been found small seams running into such enormous assays, that it is best they should not be quoted. Rich in quality but small in quantity. They are now putting in a 3-stamp mill with a capacity of five tons a day. Throughout the district included by the Copper King there is fully 1,000′ of underground work accomplished. There is no company connected with this mine, it being developed by the prospectors who first discovered it.

I have thus enlarged upon our natural resources in mineral, because after nearly five years residence among these people and in charge of this province, I am becoming entirely convinced that there is an astonishing source of wealth awaiting our Government through the yellow metal that will be taken from the mountains of Benguet. To the investor I do not think this will be in any sense an experiment, but absolute certainty for returns and generous returns at that. All these features which combine to make mining practicable are now to be found here. The timber necessary for the tunnel work grows on every claim. It is ample and easily obtained. Our forests are of pine found in three different varieties, growing, large, straight and in most mining localities to the height of one hundred feet. From these forests and under the provisions of the Forestry Act, the Benguet Commercial Company with one sawmill is producing the timber necessary for the construction of houses, public buildings and bridges.

PROBABLE ORIGIN AND COURSE OF THE HONGKONG TYPHOON

(Concluded from page 195.)

Another not less important document is the report of Capt. T. D. Andrews, R. N. R., commanding the P. and O. steamer *Delhi*, which was just entering the passes of Hongkong with the London mails when the typhoon burst upon the colony. One thing only was left out of the captain's report, which we must mention—the clear-sighted and unerring way in which he saw the coming danger. We know from a note of the passengers that long before the very first squall all was tied up and ready on deck to weather the hurricane. Now, of course, since leaving Singapore, Captain Andrews had received no signal of any kind. The report simply says: "September 18th, 4 a. m.: Wet sunrise, hard clouds, greenish sky, northeast swell; short intervals." He was then to the south of Gap Rock, where the swell must also have been felt, even probably on the 17th in the afternoon. The lighthouse was reached at 7:46 a. m. The preceding day's report calls for but one remark; on the 17th, at noon, a distinct ENE. swell was noted, the wind blowing south, force 2. She was then by 17° 58′ N. and 111° 35′ E.—that is, about 420 miles from the vortex that was rushing toward Hongkong. It is not until the next day—18th, 4 a. m.—that the breeze veered to W. with occasional squalls. The *Delhi* dropped anchor not far from Green Island, when the wind freshened to hurricane force and the rain fell with blinding violence. The center passed to the north of the *Delhi* between 9:45 and 10 a. m.

The velocity, checked by the struggle against the very high pressures of the north, went increasing, as the center was coming nearer to the coast; the track was approximately WNW. or W. by N.; the swell was noticed at 420 miles' distance on the China Sea.

Conclusions.—Whereas the ratio of the fall of the barometer was less on board the ship *Caesar* (which may be ascribed partly to the ship's movement) than at Santo Domingo, and the minimum reading at this station lower than on board the ship, we may conclude that the center passed at a greater distance north of the ship than of Santo Domingo. The veering of the wind on the *Caesar* is very similar to that of Santo Domingo. This shows that the center had retained its direction since it passed over Santo Domingo. By assuming that the center was at its shortest distance from the ship at 2 p. m. of the 16th, and that the length of the track from Santo Domingo to the point of least distance may be estimated at 80 miles, according to the circumstances of the ship's position and movement, we may further conclude that the velocity of translation of the storm was again about 8 miles per hour. Finally, the observations on board the *Caesar* show also that the storm increased in violence since it left Santo Domingo.

The fall of the barometer from 9:30 a. m. to 10:45 a. m. on board the S. S. *Delhi* is very remarkable and a record by itself—seven millimeters in fifteen minutes. This may explain the extreme violence of the wind in Hongkong

There is a very striking resemblance between the barograms of the Hongkong cyclone and that of the Aparri cyclone, which we publish side by side. The latter storm, which was felt in Guam on the 10th, destroyed the northern part of Cagayan Valley some 20 hours after the former reached Hongkong. This is the storm which passed through the south of Hongkong at about 6 a. m. of the 20th and which we reported to that colony on the 18th at 3:45 p. m.: "Typhoon out in the Pacific ENE. of Manila, moving probably to WNW.;" and on the 19th at 10 a. m.: "The cyclone has crossed Luzon near parallel 17°, direction given."

As regards Hongkong, the particulars of the catastrophe are too well known to be detailed here. I shall end this short account of facts by stating that it has been a very serious drawback not to be in telegraphic communication with Batanes Islands, there being no cable to Santo Domingo; as we could otherwise send to the neighboring observatories very precise information 48 hours before the disaster.

MANCAYAN-SUYOC MINES AND ABRA RIVER PLACERS, LEPANTO-BONTOC PROVINCE, LUZON

(Preliminary Examination by LEONARD LEHLBACH, M. E., Manager Lepanto Mining Company, Inc.)

(Concluded from October.)

The Spanish workings, which present the only semblance of a mine, are at Mancayan on the Lepanto and Bontoc claims. Here some 6,000' of regular and irregular galleries and winzes have blocked out a large body of ore which a thorough examination alone can safely put into reliable figures. The result of 36 yrs. of Spanish smelting with a crude Mexican smelter is seen by a waste or dump heap of some 100,000 tons of ore worth fully $2,000,000. I believe it safe to predict that a thorough examination will prove the existence of at least 70,000 tons of $30 ore and likely as much as 150,000 tons of a lower but pay grade in sight. It is, however, unwise to speculate on the future possibilities of this ore shoot until after a thorough examination has been made. The present development proves the existence of a shoot or chimney some 1350 long by 200' in width in which are repeated occurrences of lenticular masses of high grade copper ores. It would appear from the character of the occurrences that there is little likelihood of the shoot continuing much further N. but that it will become stronger to the S. in the Keystone claim. My examination being only a preliminary one does not place me in a position to give accurately the quantity and grade of the ore contained in this shoot.

The high grade Mancayan ores range in value from 6 per cent copper and $2 gold to 30 per cent copper and $5 gold per ton, with a small silver content. The low grade ores from 2 per cent copper to 5 per cent and from $2 to $5 gold per ton. There exists here also a large but undeveloped body of pyrite in a calcareous quartz gangue which carries some $5 and higher in gold per ton.

The native workings of Palidan, Gatugat, Cayan and Gobossen give values varying greatly and worth from 3 per cent copper to 12 per cent copper, a low grade of lead and zinc ore, and from a few dollars to $500 in gold per ton. The higher gold values being found only in small pockets or veinlets.

The Quien Sabe vein gives some $5 gold over 6' width of calcareous quartz vein which is traceable on the surface and through native, Spanish and American drifts for several thousand feet, its brecciated hanger, over 4' or so of width, gives a medium copper value.

The Laura claim in the quartz porphyry dike shows high grade copper values but has not been sufficiently developed to enable a safe estimate being made.

Spread out all over Suyoc, E. of the quartz porphyry dike, are numerous small veins giving high gold assays. They have not the appearance of strength and are practically undeveloped. It would answer no useful purpose to give their values.

The ore occurrence on the Anaconda and Elizabeth claims, cut by the Copper Queen Creak and opened up by tunnels, gives an average value of $54 per ton gold, silver and copper; many of the assays running exceedingly high in silver are not included in this average.

TREATMENT.—For a description of the earliest method of treatment I quote from the report of Sr. D. Antonio Hernandez, taking the liberty of shortening somewhat his account:—"The mineral after being extracted from the mine is submitted first to a roasting or crude melting; for this the natives open in the ground a small hole which they cover with thin sticks forming a gridiron, above which they place a small, compact heap of mineral, held down by a board or piece of tree, covering all with thin pine wood, they leave a protected hollow above the board. They ignite this at once, leaving it alone until it has consumed the wood and completely heated the sulphur of the mineral, which takes 2 or 3 hrs. The products are an impure mass of copper mixed with earthen substances and pieces of coal and scorias of quartz which offer the aspect of a breccia in which the cement has partly disappeared, converting it into a porous mass. The copper matte then suffers a melting process for black copper, which they execute in the following manner:—They make a hole six or eight fingers in diameter which they surround with stones forming a species of hearth or crucible, leaving an open space for the placing of a pipe connecting with a cylinder bellows. This consists of two cylinders made from a hollowed trunk of pine in which run pistons formed by blocks of wood dressed on their circumferences with dry herbs and chicken feathers, which are held down only by the bellows so they work in the manner of springs against the interior surface of the cylinders. In the lower part there is a hole in which they place a cane, closing the valve at the beginning of the stroke. Having formed the oven in this manner they charge it with pine fuel, mixed copper and matte, and put the bellows in motion, taking care to add fuel in proportion to its consumption, and to agitate little by little with a cane so the copper may fall to the bottom, and become cleaned from the foreign substances with which it may be mixed. When they know that the copper has all united into one mass, which should take place after 10 or 15 mins. they stop the bellows, and take out the coal and scorias that overfloat the metallic bath, leaving it uncovered until it has hardened a little and acquired sufficient consistency to permit of handling. The product is a cake of black copper, of rough and broken surface, full of earth and pieces of fuel. This cake is placed at once on a bonfire where it is left 2 or 3 hrs. making it suffer a kind of roasting process which purifies it somewhat, it being afterwards melted in the same furnace placed in a species of crucible or mold of refractory clay. The crucible is then placed in the hole with the stone cover and surrounded with fuel. A blast is then forced and after the copper is melted they uncover the bath taking out all the impurities. The crucible is removed from the furnace and later when the mass commences to consolidate is compressed with stick. Finally they take the cake from the crucible, bury it in ashes until it has cooled and smooth its surface a little by striking it with a stone."

I have been unable to obtain an account of the Spanish methods, the furnace was demolished before I arrived at the mine. From the accounts given me, the appearance of the slags, the high grade of the ore they rejected, as too poor to treat, I gather it must have been much similar to the Mexican method of long ago. There is no present activity in smelting either copper or gold ores.

It would be more or less foolhardy, if not actually absurd, to go into the detail of possible future treatment of the ores before making many careful analyses and tests; it is however possible to state the class of ore met with and give the nature of the minerals and gangue. Of metals we have gold, silver and copper of economic importance. Others such as lead, zinc, antimony, etc., have at the present outlook other purpose than to slightly complicate the smelting process.

A perusal of the previous chapters will show that the ores are rich in sulphur, the gangue silicous. The ores which will demand first attention are those of high grade by which I mean valuing over $30 gross per ton, and the medium grade ores worth from $30 to $16 per ton. The latter figure being, I believe, the lowest that will here stand direct smelting and give a profit of 20 per cent annually on the capitalization. In addition to these there are probably many hundred thousand tons of ore worth from $8 to $15 per ton which it may be found profitable to treat after first crushing and running through jigs or other concentrating plants. I will speak of the high and medium grade ores first.

There is at present no cheaper transportation than that afforded by pony back at $40 per ton. It is believed that by the operation of an automobile service as per the chapter on transportation this rate can be reduced to less than $6 per ton from the coast. Even at this price it will be seen that fuel in large quantities would be expensive. The timber on the surrounding hills has been stripped clean by the Spanish operations and while a little further afield a considerable supply might be obtained it would be absolutely out of the question to think of operating a 250 ton smelter without bringing in coke. The Abra River offers some 15000 h. p. that may be harnessed to supply all the power and light that will be needed. Limestone is close at hand. Unskilled laborers at 50 cents gold *per diem* may be brought from the coast in unlimited quantities and they have been found under good management to be efficient. Skilled men must of course be brought from Europe, America or Australia.

It is safe to suggest that partial pyrite smelting will probably be found possible here. We may reckon on using an additional charge of let us say 5 per cent coke figured on the green ore, which will with the other ingoing supplies about balance the weight of outgoing copper from the medium and high grade ores. Large quantities of the ores, from all over the district should be sent to one of the best of the American metallurgists, who after full experiments will advise and design the proper plant. It is not possible to suggest more here than that the fines will have to be briquetted, the coarse sent direct to the smelter with the fluxes found necessary after practice with them. These ores will, or can be made to average from 8 to 12 per cent copper, the silver content will be large, and if the flux carries much of the pyritous ores about $5 gold per ton. Zinc, antimony and arsenic will not be in large enough quantities to cause trouble. In a plant similar to that of the Tennessee Copper Company and described by Mr. J. Parke Channing, in *Engineering and Mining Journal* of June 22d, 1905, it will possibly be found necessary to concentrate in the furnaces twice before getting a 45 per cent matte, the lowest it would be advisable to convert.

The chapter on costs will show that I believe $16 per ton the minimum value of ore that will give 20 per cent *per annum* on the required capitalization. In an estimate of the nature of this it must however be borne in mind that I cannot afford to figure as closely as I hope and believe actual practice here will eventually warrant. Large bodies of ore worth from $8 up exist here. I believe experiments with large quantities of these ores will demonstrate that they can be economically concentrated about 6 into 1 at a saving of about 60 per cent. This seems low but it must be borne in mind that the sulphides are of very low specific gravity and, crushed, slime readily. Thus by jigs or other similar appliances an $8 ore concentrated 6 to 1 with a 60 per cent saving will make a $28.80 concentrate. If we take from this the cost of mining the extra five tons, concentration, etc., we get about an $18 ore net. And this I believe will not be far from the lowest value that for some time to come it will pay to handle.

WORKING METHODS.—I advise using the topographic map of the district, shortly to be published by the Mining Bureau, as a base, continuing Mr. Eveland's survey to include Southeastern Suyoc, unfortunately not included by him. On this should be plotted every outcrop and ore occurrence in the entire dis-

trict, with full data, Three months will complete this, during the engineer's spare time.

MANCAYAN MINES.—Firstly a thorough examination should be made of the Mancayan ore occurrences and dumps. This may be completed in 30 days if the existing surveys are accurate, otherwise, it will take double that time at least.

Diamond drilling has many advantages chief amongst which is its speed. I doubt the advisability of going to the great expense this would incur here; owing to there being no contractors in the country it would be necessary to put a large capital into a plant for which at the best there would be only a short work and that a dead one which would have to be done all over again by shafts and tunnels. Again these are irregular deposits and the core from the drill might give a blank and yet be within a few feet of a rich ore occurrence which in a tunnel would be indicated by a seam and then sought. Again on the other hand the core might give us a very rich sample which on development we would find to be nothing but a little island lense of insufficient size to have warranted the double expenditure of both the drill prospecting and the tunnel.

For these reasons I would not advise using drills at present but following the ore down with an incline shaft 5X9' sunk on or close to the western diorite-quartz porphyry contact. The driving of a double tunnel 8X10', from the Mancayan River, closely due E., a distance of about 1100' to meet the shaft at a vertical depth of some 500' below the present workings. From the incline, at intervals of 100' levels will be opened up by driving along the contact NW. and SE. single drifts 5X7' and in these, commencing at the shaft, lateral drifts will be sent into the quartz porphyry, every 300', in search of the lenticular ore bodies, which, when found, will be opened up for stoping. On completion of the main double drift the shaft will no longer be used for hoisting but ore will be shot down it from the upper levels to the mail tunnel, by means of a belt or other conveyor so as not to break the ore too finely. The double drift will be the main exit from the mine from which it will be operated until it shall be found advisable to run in a lower one. Approximately a 5,000' tunnel would cut the quartz porphyry about 1,500' lower than the present workings.

The Mancayan quartz porphyry is exceedingly hard and native labor very slow in hand drilling, so with ample water power at hand an air-compressor should be erected and the entire development done with rock drilling machines. The pump, in the sinking shaft, might be best driven by air from the compressor.

It will be found cheaper to sink the incline and drive the NW.-SE. galleries through the diorite footwall. This would ensure the entire ore body being on one side, would probably save one third in time, one half in cost of explosives and one third in cost of labor, and air. The long main tunnel will be in diorite for most of its length.

COPPER QUEEN CREEK PROPERTY.—It is essential that an accurate topographic map be made of this property, covering an area of about 250 acres.

The main level tunnels, NE. on the Anaconda and SW. on the Elizabeth should be rapidly advanced to find the limits of the ore body. These prospecting tunnels are at present too small to permit of conveniently moving about in. It will be necessary to immediately enlarge them to 5X7' at centers, between timbers; somewhat lower down the Copper Queen Creek, about 600', a suitable tunnel entrance will be found to permit running a tunnel approximately SE. to cut the vein beneath the present entrance of the Elizabeth Tunnel at a depth of about 200' lower vertically. A tunnel of about 2,500' would cut the vein at a depth of something like 800'. When the tunnel has cut the vein rise up on it to reach the present tunnel entrance, run NE. and SW. drives along the vein to open it up from the level of the long tunnel and intermediate between it and the present main level. The lowest level connected by cross cutting tunnel with the surface will be the main gallery of the mine through which ore will be brought out.

Copper Queen Creek offers at small cost some 700 h. p. The surrounding hill sides contain sufficient timber for all mine purposes for many years to come. I would suggest here the installation of a small compressor plant and that all development be pushed with some such small machine as the Murphy air-hammer rock drill. The rock is not particularly hard to drill and breaks easily. The cross cutting tunnel through the conglomerate might be driven with an ordinary 3½" rock drilling machine. It is hard. The air exhaust will ventilate the mine until natural ventilation has been created by connecting drifts and rises.

Some 2200' SW. of the Copper Queen Creek is a smaller creek which should be carefully prospected for ore occurrences either the continuation of the Anaconda-Elizabeth vein or another.

The Gobossen workings should be first carefully examined, my time was too limited to permit of giving them the close examination they deserved, and then a plan for their development inaugurated.

Below Mancayan will be found a natural smelter site, offering these inducements: It is closer to the coast than would be a site in the center of the mines (if this were not objectionable for other reasons), meaning less cost for the transportation of incoming supplies and fuel and outgoing copper; it is at sufficiently much lower elevation to permit ores being sent by gravity from the mines to the smelter; it is close to a power site.

The initial plant will probably have a capacity of 250 tons *per diem* of green ore. It is cheaper to start with a small smelter, keep it running and increase its capacity as found advisable than to start with a large one and have part of it idle for a long time.

Copper Queen Creek and Suyoc ores may be sent from the mines to the Mancayan smelter by means of an aerial tramway, requiring power only to start it, the weight of the full, downgoing buckets will operate it.

During the few early years of development the underground secondary galleries will be fitted with 12-lb. rails, the main galleries with 20-lb. ones. Self-tipping iron trucks of not more than 10 cu. ft. capacity will be used to transport the ore. Igorot trammers at 30 cents gold per shift may be obtained in sufficient quantity to operate them.

The reduction plant will be designed by an experienced metallurgist after thorough tests of the various ores have been made. Should future development demonstrate the need of a large concentrating plant it will be similarly designed.

Skilled labor will have to be imported. The cost of living here compares favorably with that of the western American mining camps, the climate is an ideally healthy one. Wages should therefore for Europeans not cost more tham 20 per cent over the scale in the Western United States. Japanese, in quantity, as engine drivers, blacksmiths, tool-sharpeners, miners, machine men, carpenters, masons, etc., may be procured at wages ranging from $1 to $1.75, gold, per shift. Ilocanos (Filipinos from the coast) may be procured in large numbers as unskilled laborers at a wage of 50 cents gold per shift. There will hardly be much to apprehend here from strikes at present.

ABRA RIVER PLACERS.—A glance at the reference map of Northern Luzon will show a river completely encircling the Mancayan-Suyoc mineral area. This is the Abra River, which rising in NE-Suyoc, on the western slope of Mt. Datá, flows in a general southerly direction until past its confluence with Copper Queen Creek, it describes a semi-circle of about a 4-m. radius, then, keeping Mancayan and Suyoc a few thousand feet to its E., takes up its long northerly journey to the coast, at Vigan, which it reaches after a meander of about 100 ms.

Each of the many rapid flowing mountain streams, which cut the rich gold veins of Suyoc, finds its way to the Abra River before it has passed Suyoc's northern limit. These are laden with a freight of rock and gold, eroded from all over the district. The Abra River in its journey around Suyoc and to the beginning of the Comillas flat, where the placers commence, has a fall of about 1 in 25, too steep to permit precipitating its valuable load, which is thus carried on, the while being ground smaller and smaller and the gold freed.

At the Comillas Valley the gradient drops to 1 in 100 and precipitation commences. The valley has a length of some 20,000-odd feet by a width of closely 3000', here, with the numerous large pebbles and boulders has been formed a natural sluice box from which but little gold has escaped. Only in the floods does the rushing torrent of muddy water carry away the finer floating gold.

The placers extend in a general N.-S. direction over a length of some 4 ms., the river through them having a meandered length of closely 5 ms. The northern end is within a mile of Cervantes, the capital of Lepanto-Bontoc Province.

As yet the placers have not been thoroughly prospected. I completed a topographic survey of them. A study of the accompanying map and sections taken from it will serve to give an idea of the quantity of gravel and the general conditions under which it is found.

Some centuries ago, when the rainfall was probably twice the present 120" *per annum*, the Abra River flowed some 2000 to 4000' from the site of its present bed, its meandering formed the highest of the benches, the largest. In cutting its way to a lower level and finding an entirely new outlet to the east of the long butte which once was its eastern bank, it has formed several benches, which show exposures of from ten to fifty feet of gravel. Undoubtedly it has built up and partly torn down, thus concentrating increased values into some of the later and shallower benches close to its present bed. Two cross-cutting streams have thus also made, over considerable areas, richer shallow placers. In times of flood many large boulders were brought down by the river and deposited all over the benches. These pebbles varying in size from 9" to 3' in diameter have made riffles that formed a perfect sluice box. Fortunately the aggregate of the large pebbles is not much more than 5 per cent of the total gravels and will therefore not appreciably increase the cost of working.

I estimate the total quantity of gravel to be roughly 35,000,000 cu. yds., although thorough prospecting may prove double that amount. Much of this will average in the neighborhood of 20 cents gold per cu. yd. Considerable areas of the shallower benches, where the gravels have been worked over and over, will probably go very much higher. I am not in a position to speak of the bed rock values. The bed rock itself is diorite and basalt.

I would advise the sinking of 61 shafts, as indicated, through the gravels to bed rock. These will be circular wells of about 3' diameter, protected at the top by a 2' high stone wall with ditch around it. Every foot of gravel taken from these shafts should be sampled and a fair portion of it taken for panning. The pebbles measuring over 6" in diameter should be placed aside that an accurate idea may be had as to their proportion to the total. This work if properly done will show within a small margin the actual value of the placers, gross and net.

Hydraulicking, in the California and New Zealand sense, will not be possible here owing to the impossibility of securing the requisite fall. It might be found practicable to elevate the gravels some 60' or so which would give sufficient fall for sluicing in a 2000' box but would by no means solve the question of tailing's disposal, excepting they could be economically handled by means of belt conveyors.

Dredging seems to me the only certain method of working these placers. An enormous water power is immediately at hand from which electric power could be economically developed to work as many dredges

as might be thought best to put in. Surplus power could be sold to the neighboring Mancayan and Suyoc mines if they advance sufficiently to require it. There is absolutely no fuel of any kind within a reasonable distance. Ample cheap unskilled labor (50 cents gold per shift) may be procured from the coast. The general conditions are such that the usual tropical cost increasers of placer mining are not to be expected. The elevation is about 1500′. I should judge that gravel going 8 cents gold per cubic yard would pay a profit.

It will be in better taste to wait until the placers have been thoroughly prospected before estimating their value. $2,500 exclusive of engineer's fee will suffice to do the work I have outlined.

TRANSPORTATION—The question of next importance, here, after the presence of sufficiently valuable ore deposits has been determined, is that of reasonably cheap transportation. We may take the smelter site as the center of our calculations, as it is the most important place for us, in this regard. This has an elevation of approximately 3,000′, is about 7 ms. NW. of the most distant of our mines, the Anaconda and Elizabeth tunnels which have an elevation of about 5,000′. Aerial tramways must give the only solution of the problem of local transportation; as there is no economic problem connected with their installation, other than securing the money to pay for them. I will not under this heading give local transportation more space.

The Cantabra Filipino Company and the leasers who succeeded Sr. Santos in the operation of the Spanish mines during a period of 36 yrs. paid little or no attention to the question of transportation. They must have realized immediately, if indeed they gave it thought at all, the impracticability of shipping out ore. Their operations were conducted on so small a scale they had no serious difficulty in procuring all the charcoal fuel they needed from the surrounding mountains. Their copper product was shipped out on pony back balancing the few supplies they required sent in. Their ports were Candon and Vigan with which they were connected by horse trails, *via* Cervantes; these are still in use as also is a newer one just completed to Tagudin. All the coast towns are connected by fairly decent wagon roads. A narrow mountain trail through Suyoc connects with Baguio, the capital of Benguet Province, from whence there is a good wagon road to the railway at Dagupan. Another somewhat longer trail *via* Cabayan and Ambaklau makes the same Baguio connection with Suyoc.

At present all supplies are brought into Lepanto *via* Candon, on pony back at a cost by contract of $40 gold per ton. It requires little study to suggest that this is somewhat expensive and prohibitive for all else than a gold bonanza, which unfortunately I have not yet found here.

It has been suggested by engineers that a railroad might be built over the mountains to Baguio. I see no reason to doubt this, but am of the opinion that it could not be done at a lower cost than $2,500,000 for the grade alone, and I can see no traffic for it after completion. This may therefore be eliminated from our calculations. Others have suggested a railroad down the Abra River Valley to Vigan. This would mean over 80 ms. of track at an even heavier first cost than the Baguio idea, with, however, this in its favor that there is every reason to believe the road for 60 ms. from the coast would pay handsomely. I doubt its ever becoming an aid or relief to the mining industry of the province.

The closest railway connection to be had would be the coast at Tagudin which now has a horse trail from Cervantes on a maximum 6 per cent grade. The distance on an air-line from the smelter site is about 26 ms. I believe that a railway having a length of approximately 35 ms. could be constructed on a maximum 6 per cent grade with sharpest curves, say, a 100 foot radius, fully equipped for about $1,750,000, gold, obviously the fixed charges on such a capital would be sufficient to prevent its construction for many years to come, certainly not for 10 yrs. after the mines are taken hold of. We may therefore, sorrowfully, but none the less certainly, put a railroad out of our minds.

I have spent considerable time on the thought of putting in an aerial tramway from the mines to the coast and erecting the smelter there. It has its *pros* and *cons*. The first cost will be pretty much the same or heavier than that of the relief I will give as the safest. The cost of operating the tramway will be pretty much the same. There is, however, always the chance of a breakdown during the terrible typhoon season which would lay up the smelter for a week, every now and then. Also I am averse to building the smelter in the center of an average temperature of 80° F. Our skilled smelter men would not last long and with unskilled men the costs would be too high and the results too poor.

I believe that a good wagon road can be built from the smelter site to Tagudin, practically on the same grade as would the railroad I speak of above. The cost I estimate at $175,000. In the future it can always be turned into a railroad grade by a little more grading and attention to curvature. This I propose using as an automobile road, operating on it six 10-ton automobile trucks, of heavy construction, such as are not unfrequently met with in America. In my calculations, based on smelting 250 tons *per diem* of sulphide ores, assaying an average of about 8 per cent copper, I find that three trucks, such as I mention above would meet our requirements during 6 or 8 mos. in the year, from June 15th to October 15th each year it will be found necessary to run along the coast from Tagudin to San Fernando from whence on completion of the railroad connecting it with Dagapan, to be completed withing 2 yrs., direct railroad communication can be had with Manila, the island's largest port where on completion of the new port works large vessels may lie alongside dock. This will require an additional three trucks. These trucks will carry 5 tons of coke or 8 tons of copper and on occasion may be made to handle a 10 ton load. They will be of 60 h. p , driven by an European *chauffeur* with a native helper.

The Government is suffering from the effects of expecting the Malay to work when he does not have to, resulting in postponement after postponement of the land tax. The Malay does not take any too kindly to agricultural work, although when he has to he will do it. He is a good mechanic and likes the work. Consequently little or no finantial aid is to be counted on from the Government.

It is believed that, as it is really a public necessity, it will put the road from San Fernando to Tagudin in first class condition. The concessionaires who are to construct the railroad from Dagupan to San Fernando also have a charter for a road along the coast to Laog which will pass through Tagudin.

An automobile service is no longer an experiment. It is in active operation in many places. In Death Valley, a 100-ton automobile traction engine daily hauls 20 cars laden with 100 tons of borax from the desert to civilization. A traction engine will hardly do here on account of the curvature and its long trailing load.

CONCLUSIONS.—Mancayan presents an attractive mining proposition which should receive a thorough examination to determine accurately its undoubted great value. After a preliminary examination I estimate positive ore on dumps of 100,000 tons value $2,000,000, and in the mine ready for stoping 70,000 tons value $2,100,000, both together having a net value of about $2,125,000, gold; beyond these conservative estimates none are advisable until a thorough examination of the mine has been completed.

Suyoc presents many promising prospects which warrant energetic development backed by sufficient capital to ensure success.

The Abra River placers should be thoroughly prospected to prove the quantitly of gravel and its value. The other conditions are right.

Labor is at hand in sufficient quantity for prospecting and preliminary development. Fifty miles away the coast will supply all the unskilled labor required to operate a second Butte.

Water power may be developed in the district up to 15,000 h. p. Much more may be harnessed somewhat further afield.

The ores are such as to permit of partial pyrite smelting and the coke required to be brought in will not equal the copper to be sent out. Large quantities of charcoal may be burned from lumber standing within a radius of a few miles.

The transportation problem is simply that hitherto nothing has warranted the expenditure of even a moderate sum of money to construct a wagon road because there would have been nothing to ship over it. Once the fields are demonstrated to warrant the small expenditure stated under "Transportation" 12 mos. will make this no longer a problem.

MANILA'S BUDGET, 1906-7

The Philippine Commission has passed the appropriation bill for the Municipality of Manila covering the fiscal year to end June 30th, 1907. The total of appropriations for all purposes is ₱3,028,148 80, distributed as follows:—

Municipal Board	₱ 203,000
Law Department	117,000
Fire Department	290,000
Police Department	837,500
Department of City Schools	292,000
Department of Assessments and Collections	107,500
Department of Engineering and Public Works	544,000
Department of Sanitation and Transportation	595,000
Public Works	42,184.80
Total	₱3,028,148.80

PEARLING INDUSTRY IN THE SULU WATERS OF THE PHILIPPINES

(Concluded from page 197.)

rake become lodged at the bottom of the sea, it is pulled out by means of the thinner rattan and the operation proceeds as before

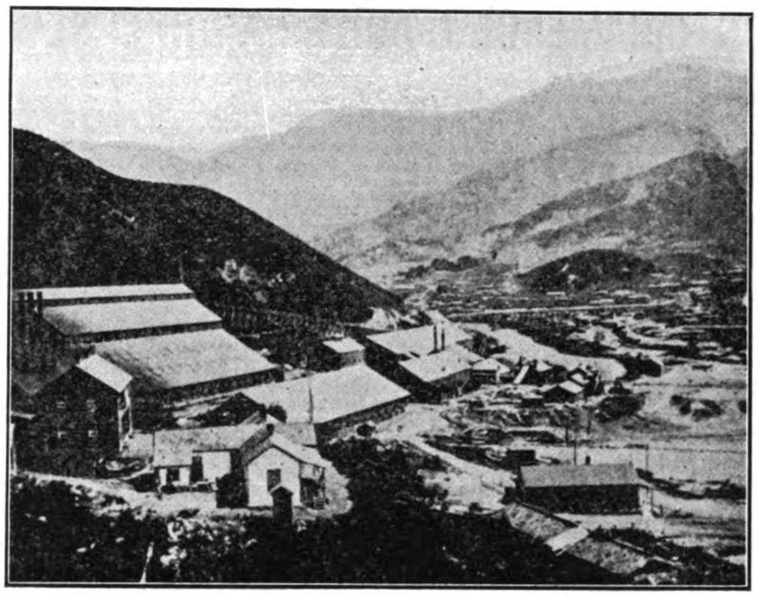
When the tide turns, the boats also turn and go with it.

The shells having been deposited at the bottom of the boat are opened by means of a sharp knife, with which the pearlers cut out the oyster, which they then search for flesh pearls. These latter are uniformly the finest. The points to be sought in a pearl are size, color and luster, sphericity, and freedom from spots, specks and blemishes. Pearls taken from the surface of the shell itself are always deficient in some of these respects.

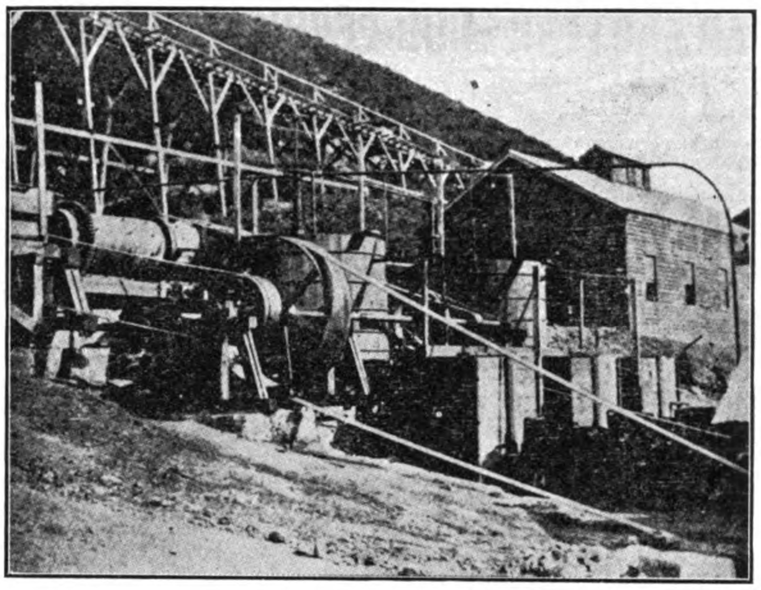
DIVING FOR PEARLS.—In shallow water, where the bottom can be seen, the natives dive for the shells. The boats are paddled along slowly with the tide; a man in the bow keeps a close watch upon the bottom of the sea, which can easily be seen with the naked eye in these clear fishing-grounds, and when a shell is seen he dives head first to secure it. Some of the men are expert divers, going to a depth of 18 to 20 fathoms, unaided by the use of weights.

Deep-water pearling is carried on quite extensively by companies who send many fishing boats out from Jolo. These divers use the diving apparatus, helmet, waterproof suit, pump, etc. Many valuable finds occur at great depth.

MARKET HAMPERED BY DATUS.—The sale of pearls, before the American government regulated the industry, was greatly hampered by the Moro chiefs. The natives' lives were very open. Whenever a man did anything the fact was usually generally known. Due to the autocratic power possessed by the chiefs, they claimed and took nearly everything they wished. If a fisherman found a pearl of any value it was at once appropriated by the chief. Should he have sold it and the transaction reached the ears of his datu, the man would be fined a greater sum than the value of the pearl, or otherwise punished. This led to sequestration of their funds and to clandestine dealings with the pearl traders.



TARACOL GOLD-MINING CAMP, KOREA



TUBE-MILL AND EXPERIMENTAL CYANIDE PLANT

EXPERIMENTAL TUBE-MILLING IN A KOREAN GOLD MINE

(*Concluded from page 190.*)

By feeding the concentrate and cyanide solution with a consistence of one to one through the tube-mill, we are able to get the finest grinding and the best results. The agitators will only have to be filled once to contain a full charge. While one agitator is being filled, the other is decanting and getting ready to be discharged. At the head of the launder (leading from mill to agitator) a pipe was run to the stock cyanide vat above, so that we can add enough solution to keep the launder clear. With clean concentrate, it is necessary to have a steep grade.

The strong cyanide solution (0.43 per cent) is used in the tube-mill and agitators, while the weak one—employed for washes—tests 0.1 per cent. No cyanide is added to the weak solution. Lime is added (about 2 lbs. per ton) with the concentrate as it is fed into the mill.

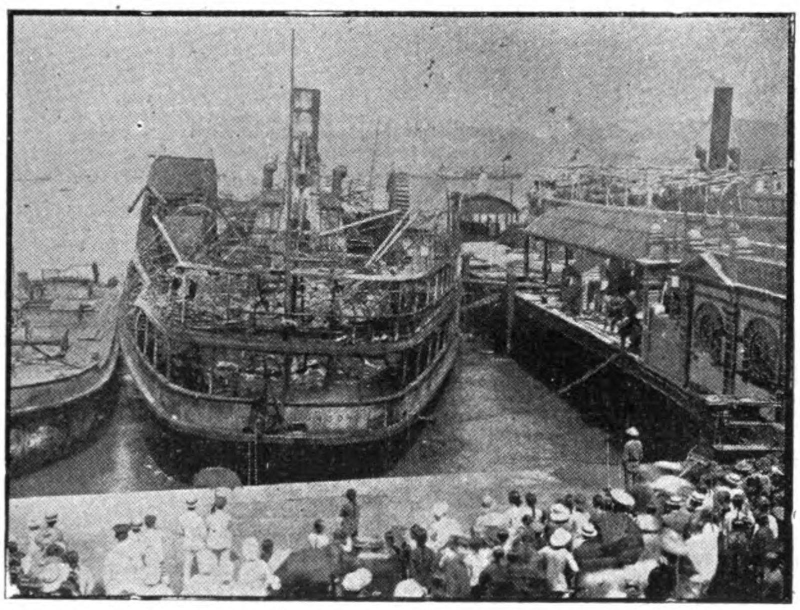
The old method of cyaniding concentrate here is by mixing with 48 per cent sand and percolating in vats from 20 to 30 days. This method gives an average extraction of 80 per cent.

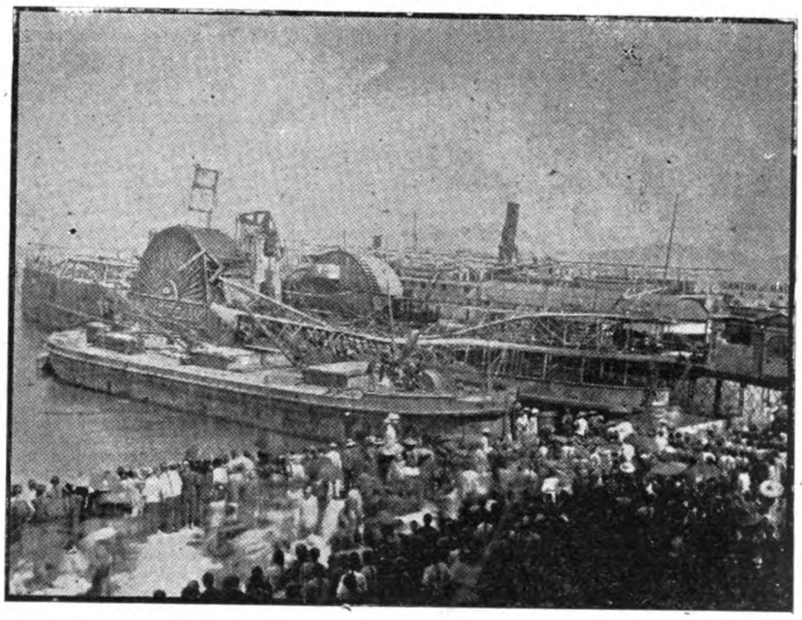
The extraction obtained at present with the tube-mill and agitators on clean concentrate is 93 per cent. By gradually making improvements we may possibly better these results.

CANTON RIVER STEAMER "HANKOW"

The Canton River steamer *Hankow*, which was practically gutted by fire at her mooring in Hongkong, October 14th, was a fine vessel and one of the last of her type in the Far East. In this connection *The New Weekly*, published in Hongkong, says:—

"The *Hankow's* old-style walking beam and huge paddles went out of date long ago, and the twin screws are all the vogue. It does not say that because the paddles have been superseded by the screws that the screws are the best. There are engineers who will tell you that for the work on which the *Hankow* was engaged the paddles are the best. She was certainly a cheaper boat to run than, say, the *Powan*. Her coal consumption was less and her cost of upkeep was less. The huge paddle wheels of the *Hankow* are of a type specially designed by those interested in her construction. Most paddle wheels are smaller in diameter and are worked on a different principle, but the *Hankow* has always acted up to her makers' hopes. She was a popular vessel, has done good work, and will no doubt continue to do so when her superstructure is rebuilt. The *Hankow* was one of three sister ships which were built for the Far Eastern river trade. She is about 32 years of age and was in a wonderful state of preservation; her hull being, in shipping parlance, as "sound as a bell. Her superstructure, which has been destroyed by the fire, was renewed 18 years ago. Before going into the service of the Macao Steamboat Company she plied on the Yangtsze River and has always been a great favorite with Chinese passengers. The *Hankow*, it is interesting to note, had a predecessor of the same name in Chinese waters which was destroyed by fire at Canton in 1865. The bell from this steamer is now on the well-known excursion steamer *Heungshang*, which still remains on the rocks, where she ran ashore during the great typhoon and it was from a mould made from this bell that the bell for the Peak Church was cast. There was, however, no connection between the *Hankows*, the first being operated by an entirely different company. The *Hankow's* sister ships were the *Peking* and the *Shanghai* and the former is still running between Shanghai and Ningpo. The *Shanghai* was, years ago, destroyed by fire on the Yangtsze River."





Illustrations by courtesy of *The New Weekly*, Hongkong.

TWO VIEWS OF THE HONGKONG-CANTON RIVER STEAMER "HANKOW" AFTER HER PARTIAL DESTRUCTION BY FIRE

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

PERSONAL

MR. J. W. BEARDSLEY, C. E., M. Am. Soc. C. E., Director of the Bureau of Engineering of the Philippine Islands, has returned to his post of duty after an extended vacation in America.

MR. RICHARD T. LAFFIN, 2d Vice-president and General Manager of the Manila Electric Railroad and Light Company, has returned to his post of duty after an extended business sojourn in New York City. He returned to the Philippines *via* the Suez Route.

MR. CHARLES M. SWIFT, President of the Manila Electric Railroad and Light Company and one of the promoters of the railway system on the Islands of Cebu, Panay and Negros, Philippine Islands, will arrive in Manila from the homeland shortly after the first of the new year.

VICEPRESIDENT AND CHIEF ENGINEER WILLIAM POLAND, of the Philippine Railway Company, which has undertaken the construction and operation of the new railroads in the Visayan Islands, is *en route* to Manila where he will establish offices. Mr. Poland was formerly chief engineer of the Alaskan Railroads.

ELECTRIC LIGHT, ETC.

KOYTO-OSAKA ELECTRIC RAILWAY.—The survey for an electric line between Koyto and Osaka is in progress. The construction is expected to be completed within 18 months.

MILITARY TELEGRAPH LINES, PHILIPPINES.—Arrangements are being perfected by the War Department at Washington for turning over all the military telegraph lines in the Philippines Division to the Civil Government.

ELECTRIC RAILWAY AMALGAMATION, JAPAN.—There is good prospect, according to *The Japan Times*, that four electric railways—the Keihin, the Yokohama, the Enoshima, and the Odawara—will be amalgamated, and that the projected Atsugi line will join the union.

TRAMWAY, SAGHALIEN.—The Japanese Government have commenced the work of constructing an omnibus railway between Korsakoff and Vladimirofska, about twenty miles. The construction will be concluded in June. The cost is reported to be about a hundred thousand *yen*.

NEW ELECTRIC RAILWAY SYSTEM, KYOTO.—Japanese capitalists are organizing a company for the purpose of constructing and operating a new system of electric railways at Kyoto. It will have a capital of -Y-3,005,000, divided into 60,000 shares. The system will be 15 miles in length and run through and around the City of Kyoto.

RAILWAY, ETC.

HANGCHOW RAILWAY.—The route of the Hangchow Railway has been fixed, and will pass from Kiangkan, along the eastern side of the Grand Canal, to Hungchinkiao *via* Konshanmen.

KAWASAKI DOCKYARD COMPANY.—This company is reported to have made arrangements to begin the business of the manufacture of railway locomotives, carriages, freight cars, etc., the articles of association of the company having been amended accordingly.

SHANTUNG (CHINA) RAILWAY.—This line did a prosperous business last year, having conveyed 30,000 tone of freight and 795,000 passengers, which is an increase of 65 per cent in point of freight and 42.5 per cent larges in passenger traffic than the preceding year.

RAILWAY COAT-OF-ARMS, F. M. S.—The Railway Department of the Federated Malay States has adopted the following coat-of-arms, which will surmount the doorways of all stations:—On a field verte, a car sable, surmounted by an "A" gules and a "B" argent; supporters a European and an Asiatic, rampant, regardant; crest, an Autocrat, on a wreath of the colors; motto *Stat pro ratione voluntas*.

RAILWAY BUILDING IN CHINA.—Railway building in the Namti Valley, China, is more destructive to human life than ever was the case with work on the Isthmian Canal. The American consul at Nanking, Mr. T. Haynes, reports that the death rate in that valley in China is 70 per cent of the total number of men employed, and even then work is suspended and the men removed during the summer rains.

DOUBLE-TRACKING THE SIBERIAN RAILWAY.—The Russian authorities have decided that the work of laying down a second line of rails along the Siberian Railway shall be begun next spring, and that until that time certain branch lines shall be laid down, as already projected, to connect the Siberian Railway with Tashkend in Russian Central Asia and with the Steppe region northeast of the Aral Sea.—*The London and China Express.*

RAILROADS IN VISAYAN ISLANDS, P. I.—Governor-General James F. Smith, accompanied by several high Government officials; Mr. F. A. Molitor, Supervising Railway Expert, and E. J. Beard, Chief Engineer to Messrs. J. G. White & Co., constructing contractors for the Philippine Railway Company, visited Cebu about the middle of the current month, where the Governor-General formally inaugurated the actual construction of the railroads in the Visayan Islands, which are being built under Government concession.

PEKING-KALGAN RAILWAY.—The section of the Peking-Kalgan Railway from Fengtai to Nankow has been opened to traffic. This line is being entirely undertaken by Chinese. Fengtai to Nankow represents one fourths of the whole line completed, which will tap the smokeless coal region of Chimingshan. The ties used in the construction are partly from Japan and partly from America, but the locomotives are from England. Three-fourths of the line are still under construction which requires a large quantity of timber and great expenditures.

CANTON-SAM SHUI RAILWAY.—It is reported from Canton that the Canton-Sam Shui branch of the Canton-Hankow Railway, is in such a dilapidated state owing to the neglect of maintenance of way by the Chinese that it will require the expenditure of about $1,060,000 to restore the line. Some foreign engineers lay the trouble to the American engineers who built the line, but the latter fix the blame upon the Chinese. The directors of the company are greatly discouraged over the condition of the road, and are experiencing difficulty in finding the means to effect the necessary repairs.

SPEYER RAILWAY SYNDICATE, PHILIPPINE ISLANDS.—General Manager Horace L. Higgins, of the Manila & Dagupan Railway, representing the Speyer Syndicate, which is to construct railroads on the Island of Luzon under Government concession, and the Manila Navigation Company have closed a deal whereby the property of the navigation company becomes the property of the syndicate. Three river steamers, three steam launches, 22 steam lighters, a number of cascoes and a shipyard at Pandacan, represent the property involved in the deal and will be utilized in the construction of the new lines of railway in the transportation of materials and supplies.

TARLAC RAILROAD, NORTHERN LUZON, LUZON, P. I.—The construction of the Tarlac railroad is progressing most satisfactorily. Manager Thurber, of the Manila Construction Company, has a force of 300 native laborers on the job at the Panique end of the line, and rails are being laid as rapidly as the grading is finished. The ties, all of native timber, are distributed along the route to Camiling, and the rails, all of which have been received in Manila, are being carried north as quickly as possible. Bridge and culvert work is keeping pace with the ground-level construction, and it is the belief of the company promoting the line that it will be open for the handling of freight by the time the crops for this year are ready for shipment, which will be about January.

MUKDEN TO ANTUNG BY RAIL.—Says *The London & China Express*:—The trip from Mukden to Antung is very invigorating as the miniature engine and trucks toil up and down and around all angles and grades, but with rarely an accident. The scenery is very beautiful. The line from Wiju on the Yalu River to Seoul is well laid and has some very fine carriages. When all the railways are finished Mukden will be a great railway center, with its lines to Fusan (for Japan) and Port Arthur, or Tairen (Ta Lien or Dalny) for Shanghai; and the line for Peking, Tientsin or Hankow and Central China. The line to Antung is at present a light military road, but a permanent one is being constructed. Very much is yet to be done to put the stations on the main line affected by the war into proper condition.

RAILWAY ROLLING STOCK, SIAM.—The decision with regard to the bids for rolling stock that were publicly opened on September 4th, at the head office of the Royal Siamese Railway Department, Bangkok, has been announced, and tenders accepted as follows:—*Baume et Marpent, Haine St. Pierre, Belgium*—Fifty open iron wagons without brake, unit price £180, total £9,000; 50 open iron wagons with brake, unit price £196, total £9,800. *Ban der Zypen & Charlier, Cöln, Deutz.*—One inspection car, £1,446; eight wooden covered wagons for piece goods, with shelves, unit price £260 15s, total £2,086; 35 iron covered wagons without brakes, unit price £173 5s, total £6,060 15s; 15 iron covered wagons with brakes, unit price £196 17s, total £2,952 15s; 11 cattle wagons without brakes, unit price £268 12s, total £2,954 12s; five cattle wagons with brakes, unit price £292 12s, total £1,463; 11 timber truck pairs unit price £233 7s, total £2,566 17s. *Brush Electrical Engineering Company, Ltd., London S. E.*—Eight composite carriages for 1st- and 3d-class, unit price £585, total £4,680; 10 composite carriages for 2d- and 3d-class, unit price £562, total £5,620; 32 3d-class carriages without brakes, unit price £493, total £15,776; 16 3d-class carriages with brakes, unit price £513, total £8,208; seven guard and luggage vans, unit price £426, total £2,982.

RAILWAY CONSTRUCTION IN JAPAN.—The actual condition of State-railway work in Japan is given as follows:—*West Central Line, Between Nagoya and Miyakoshi*—Work is proceeding on the 10-mile section from the Nakatsu River to Sakashita and on the iron bridge over the Kiso. East of Sakashita the route has been surveyed and the land is being purchased. *East Inyo Line, Maizuru*—Work has been commenced on the 4½ mile section from Ayabe to Sonobe, and surveys are being made of the Fukushima-Wadayama and Wadayama-Shirosaki sections. *Hokuriku Line, Toyama to Naoetsu, 75 Miles*—The survey of the Toyama-Uwatsu position has been finished and the land is being purchased. *Kagoshima Line, Kagoshima to Yatsushiro, 92 Miles*—The portion between Kagoshima and Yoshimatsu has already been opened and work is proceeding on the Yoshimatsu-Hitoyoshi and Hitoyoshi-Yatsushiro sections, a distance of 52 miles. Between Yoshimatsu and Hitoyoshi there is an 8,000′ tunnel at Yadake so that the work will not be completed before 1909. *Hokkaido Line, Oshigawa to Kutshiro*—This road has been opened with the exception of the 42-mile section between Ochini and Obohiro, and on which work is now progressing. *Doubling the Tokaido Line*—Portions of this work have been finished and portions are in hand. Two sections have not yet been touched, *viz.*, that between Nakaizumi and the Tenryn River, and that between Gifu and the Kiso.

PUBLIC AND PORT WORKS, ETC.

FOOCHOW DOCKS.—The Council of Army Reorganization of the Chinese Government has decided to improve the dock at Foochow and appoint a responsible official as director of the dock.

PROVINCIAL SCHOOL BUILDING, SORSOGON, P. I.—The people of the Province of Sorsogon, P. I., have begun the construction of a provincial school building which will cost $75,000 gold.

PORT OF RANGOON, BURMA.—The shipping interests of Rangoon are threatened very considerably by the rapid silting up of the Hastings Shoal, so much so that the shipping agents have asked the port commissioners for relief.

INSULAR LUMBER COMPANY.—This company is about to begin the construction of a sawmill on its valuable tract of timber land in the Visayan Group, Philippine Islands, which will be equipped with modern machinery and have a capacity of sawing 200,000′ of lumber per day. The construction will be under the supervision of Mr. W. A. Campbell, M. E.

NEW MITSUI WORKS, KOBE.—The application made to the Japanese Government by the Mitsui Family for permission to reclaim the seafront in the vicinity of the new Ikutagawa, Kobé, with permission to construct a landing place there, has been granted. The Kobé Harbor Works plan, published by the Minister of Finance, is said to include the Mitsui works.

TIENTSIN BUND IMPROVEMENTS.—The work in connection with the erection of shear legs on the Tientsin Bund, opposite Bromley-rd, is progressing. The wharf on which they are to stand is nearing completion, all the piles having been driven in. A few more weeks will see the bund equipped with this necessary apparatus for commerce.

DRYDOCKS AT MOJI.—A Japanese syndicate has obtained permission from the Tokyo Government to construct drydocks at Moji. An extensive area of land will be reclaimed at Okubo, Moji, and two docks built thereon, work to begin next (December) month. The undertaking is expected to be completed by the end of 1908 and the cost is estimated at -Y5,000,000.

LAND RECLAMATION IN INDIA.—A scheme is proposed at Lahore, India, by the Government to reclaim a large area of land on the Dutch plan. The Rann of Cutch is a seashore waste, with narrow inlets which would be closed, allowing the shallow water to evaporate. The saline deposits would be washed out by a great canal from the Indus. The application of scientific agriculture to the reclaimed land and the construction of a railway linking Karachi and Bombay would complete the enterprise.

FLOATING DOCK, TSINGTAU, CHINA.—The floating dock at this German Colony is capable of taking in vessels of 16,000 tons capacity. It is fitted with the most modern appliances for lighting with an electrical supply operated from a central station, so that work may be carried on during the night. A steam plant is also provided that vessels in the dock may be heated during the winter. The shops are fitted for all kinds of work, and two cranes of 20 tons capacity each are available. The dock rates differ according to the size of the vessel, from about 20 cents gold per ton for a 500-ton vessel to 10 cents gold per ton for a vessel of 6,000 tons up.

SINGAPORE BUDGET, 1907.—The revenue of the Municipality of Singapore for 1907 is estimated to be $2,775,495, and the expenditure $2,768,461. The question of improving the sewage disposal system has been shelved, although hundreds of thousands of dollars are appropriated for electric power, new river bridges, roads, etc. Assessments are expected to show an increase of about $85,000 and rents of $10,000. The gas supply shows a falling off in estimated revenue, while no increase is expected from electricity. "It is interesting to note," says the *Singapore Free Press*, "that, roughly speaking, the cost of staff or *personal emoluments* in the municipality is about 19 per cent of the receipts, while in the Government administration the cost is about 28 per cent of the revenues.

OSAKA WATER WORKS:—Owing to the remarkable increase of late in the population of Osaka, now exceeding a million, the accommodation of the existing water-works is quite inadequate. The waterworks were extended about five years ago to supply water to a population of 800,000, so that in the summer the supply of water has to be cut off for certain hours every day. The Municipal Council has now adopted a scheme for the further extension of the works, which is estimated to cost Y11,000,000. It is proposed to construct the intake works at Kunijima, and a filtering-bed and a reservoir near Suita, 250ft above sea-level. The money required for the extension will be raised by means of a foreign loan, with interest not exceeding 5½ per cent, the actual face-value to be advanced without discount. The scheme will be laid before the Municipal Assembly in a few days

SHIPBUILDING, ETC.

URAGA SHIPBUILDING COMPANY.—This company intends to establish further shipbuilding yards, and for this purpose has increased its capital from $950,000 gold to $1,200,000.

DESTROYER "UDZUKI" LAUNCHED.—The Japanese destroyer *Udzuki* has been successfully launched from the Kawasaki dockyard, Kobé. She is one of five destroyers ordered from the company.

Dock Laborers' Strike, Hongkong.—The strike at the Hongkong dockyard ended recently in the complete defeat of the men, who gave up their demand for an increase in wages and returned to work.

U. S. S. "Ranger" a Training Ship.—The Navy Department at Washington has agreed to turn over the ship *Ranger* to the Government of the Philippine Islands for the purposes of a training ship for the use of the insular nautical school, the students of which are Filipinos. The *Ranger* has been in commission with the Asiatic Fleet.

River Steamer "Hankow" Burned.—The Canton River steamer *Hankow*, owned by Messrs. Butterfield & Swire, was burned at her wharf in Hongkong Harbor, October 14th. She was valued at $400,000, and including this sum the estimated loss which takes in cargo, is $1,020,000. About 130 persons were killed in the catastrophe.

Saving the "Manchuria."—It is estimated that the cost of pulling the big liner *Manchuria* off the reef near Honolulu and taking her to port will amount to more than $500,000. One hundred thousand dollars worth of tackle was left at the bottom of the ocean. Litigation over salvage has been avoided by definite agreements with the owners of all steamers that participated.

Kure Naval Arsenal, Japan.—Papers received from Japan announce that the Naval Office at Tokyo has decided to make the Kure Naval Arsenal the greatest shipbuilding yard in the Far East. At the present the Kure Arsenal has a steel foundry that can turn out 12" and 8" guns. Recently the slips for building the battleships *Aki* and *Ikoma* have been laid out, each measuring 400 yards in length. The number of ordnance works has been increased from 14 to 16. Other works are also being enlarged.

Repairs to U. S. A. T. "McClellan."—The War Department at Washington has awarded the contract for repairs to the transport *McClellan* to the Tanjong Pagar Dock Board, with works at Singapore, and the ship has sailed from Manila under her own steam for that place, conveyed by a tender belonging to the contracting company. The Tanjong Pagar Dock Board's bid was $55,079 gold, and eight months will be required to complete the job. The bid of the Shanghai Dock and Engineering Company, Ltd., was lower than that of the Singapore company, but by its terms 10 months would have been required to make the repairs. The question as to whether it was desirable to have the work done two months sooner and pay more money for it, was submitted by the Chief Quartermaster of the Philippines Division to the Quartermaster-General of the Army, with the result as above stated.

River Navigation in China.—According to the *South China Morning Post*, the Marine Iron Works of Chicago, in addressing the American Consulate at Hongkong recently, had this to say of interest to owners of water craft:—"It can only be a question of time when the majority of the many rivers of China will each have to use at least a few powerful very light-draft steamboats. We refer to the head waters and central portions of those rivers in particular. Neither does their swift current and shallowness prevent the successful operation of suitable vessels. It may interest you to know that we are just completing a similar boat for the Hudson Bay Company of Canada, for use on the Mackenzie River, a run of over 1,000 miles. These boats average about 18" draft ready to load, and it is not unusual to build them for carrying from one to 10 tons of cargo on each additional inch of draft, according to the hull dimensions."

MINES, MINING AND MINERALS

Pumps in Australia.—There is a large trade in Australia in mining pumps just at present.

Ibaraki (Japan) Coal Mining Company.—With a view to supply the rapidly increasing market effectively, this company has installed new machinery, and with these improvements it can work over 10,000,000 *kin* of coal per month.

Gold Yields of Japan and Formosa.—The yields of gold for Japan and Formosa, for 1905, are estimated at 95,000 and 66,000 ozs., respectively. Each country has shown a steady increase for some years past, and each has the capacity for further expansion, especially Formosa.

Shantung (China) Mining Company.—The business of this company is progressing, turning out at the present time about 135,000 tons of coal per year. There are 2,000 Chinese employed at the main diggings, and their pay averages from 20 to 40 cents gold per day. They work in shifts of eight hours.

Coal Trade of Moji.—The quantity of coal shipped to foreign countries from Moji during September was 58,146 tons, and that taken by foreign vessels for their own use 47,328 tons. The quantity of coal transported to home ports during the month was 65,430 tons, and that taken by Japanese vessels for their own use 36,177 tons. This is a total decrease of 12,016 tons from the returns for August.

Tin in Mindanao, P. I.—An American prospector claims to have struck a "mountain" of tin in the Island of Mindanao. Specimens of the ore have been assayed by the geologists of the Division of Mines, Bureau of Science, Manila, and are said to be rich in tin. The close proximity of Mindanao to the tin regions of Malaya should, it is believed, portend tin in quantity in that island.

Coal on the Mongolian Border.—The Chinese Railways Company has discovered, on its property in the vicinity of Hsinminting, or rather just over the Mongolian border, a very rich bed of coal of almost pure carbon (*cannel*). It will be an easy matter to construct a branch line to the area, and just beyond there are known to be rich gold and copper resources. Possibly there are other minerals.

Taiya Iron Mine.—This mine supplies iron ore to the Wakamatsu Foundry. Up to the month of September the quantity of ore sent to Japan was 110,000 tons, and it is expected that when the Hangyang Arsenal, now in course of enlargement, is completed, the demand of that industry combined with the demand of Japan will total 300,000 to 400,000 tons per month. Five steamers are now engaged in transporting the ore to Japan.

Japan's Mining Revenue.—The revenue of the Mining Bureau of the Japanese Government for the present fiscal year is expected to show an increase of -Y-300,000 over last year, when it amounted to -Y-2,170,000. The authorities intend to increase the number of mine inspectors. It is stated that if this plan is carried out the receipts of the bureau will further increase the amount to -Y-2,900,000 or -Y-3,000,000.

Asbestos Beds, Northern Luzon, P. I.—Rich deposits of asbestos covering hundreds of acres and containing hundreds of thousands of tons of the mineral, have been located in the mountains of Northern Luzon. Samples of the asbestos have been examined in the Mining Division of the Bureau of Science and pronounced excellent in quality with not more than from 1 to 2 per cent of alloy. The deposits are inlaid between the layers of asbestos with talcum and silica, both valuable deposits, and the fields of asbestos are within a few miles of excellent harbors.

Mining Industry in Hokkaido.—Since the termination of the war with Russia, the Japanese have revived the mining industry of Hokkaido to such an extent that the Mining Bureau of the Department of Agriculture and Commerce at Tokyo has become congested by the number of applications. Applications for permission to engage in prospecting cover 300,000,000 *tsubo* of territory, while those for the actual working of mines extend over some 110,000,000 *tsubo*. One *tsubo* equals four square yards. There is great variety in the character of mines. They are chiefly gold (quartz and placer), copper, coal and manganese.

Oil Industry of Burma.—The oil industry of Burma is growing rapidly. In 1896-7 the total imports of mineral oils into India from foreign countries were, roughly, 64,000,000 galls., while the exports of Burma oil from Rangoon coastwise were 40,000 galls. In 1905-6, the period ending March 31st, the foreign imports were 51,000,000 galls., while the Burma oil exported to India ports was 47,000,000 galls. In other words, in 10 years the Burma oil exported to the Indian market has increased over a thousandfold. Ten years ago the Burma oil exported to the Indian market was 1-1600 part of the foreign mineral oils received, while in the latter year under consideration the figures were nearly equal.

Shipments of Gold from Australia.—There was a large increase in the shipments of gold from Australia from the beginning of the present year to July 31st, in comparison with those for the corresponding period of 1905, showing an increase of $23,428,275 gold. The shipments compare thus:—

	1905	1906
Melbourne	$ 2,734,992	$10,631,808
Sydney	5,916,997	15,191,188
Brisbane	8,760	———
Adelaide	54,748	875,970
Fremantle	13,321,946	18,766,752
Total	$22,037,443	$45,465,718

Ruby Monopoly, Burma.—During the last year in Burma 1,773,129 trucks of ruby earth were washed, at an average of $1.50 gold per truck. This is less 130,000 trucks than were washed the year previous. This decrease is reported due to the working out of the Choungzone Mine. The output of this mine came from corners and crevices of the rock, which increased the cost of taking out the dirt. Work will soon begin at the Myntada Mine, which is very close to the Choungzone, and will use the same washing machinery without necessitating the removing of it. The royalties received by the Government from native miners during the year amount to $62,975 gold, which is about half what it was in 1904. There was a net profit for the year 1905-6 of about $40,000 gold, and a dividend of 12 cents a share was declared. But for the control held by a few persons over the ruby deposits of Burma, and the disposition to limit the output, rubies would be 50 per cent cheaper than they are on the market today. Burma coal-oil and ruby deposits are held in the tight fist of monopoly, and it looks as if no power would be able to break it.

Federated Malay States Tin.—The following statistics of the tin output from January to July, 1906, inclusive, are published by the Mines Department of the Federated Malay States:—

OUTPUT IN PICULS

Perak	258,277.75	250,060.34
Selangor	170,214.95	154,004.05
Negri Sembilan	48,742.06	44,796.08
Pahang	18,861.01	19,320.86

DUTY IN DOLLARS

Perak	2,751,956.62	2,959,823.45
Selangor	1,838,188.72	1,825,327.79
Negri Sembilan	526,656.58	532,812.33
Pahang	125,714.18	48,617.43

INCREASE OF OUTPUT AND DUTY

Perak	——— piculs	$207,866.83
Selangor	——— piculs	———
Negri Sembilan	——— piculs	6,155.75
Pahang	459.85 piculs	22,903.25

DECREASE OF OUTPUT AND DUTY

Perak	8,217.41 piculs	$———
Selangor	16,210.90 piculs	12,860.93
Negri Sembilan	3,945.98 piculs	———
Pahang	——— piculs	———

SUMMARY OF OUTPUT AND DUTY

7 months 1905	496,095.77 piculs	$5,242,516.10
7 months 1906	468,181.33 piculs	5,466,581.00
A decrease of	27,914.44 piculs	———
An increase of	——— piculs	224,064.90

FINANCIAL AND MISCELLANEOUS

American Consulate at Kiaochow.—An American Consulate has been opened at Kiaochow, China.

Hokkaido Colonial Bank.—This bank has decided to increase its capital from -Y-3,000,000 to -Y-5,000,000.

Tobu Railway Company.—This company has notified the issue of a loan of -Y-1,500,000 at 6 per cent *per annum*.

Hiogo Gas Company, Ltd., Kobe.—This foreign concern has disposed of its business to the Kobé Gas Company, Ltd., a Japanese company.

Sugar Refineries Amalgamate.—The Japan Sugar Refinery Company and the Osaka Sugar Refinery Company have amalgamated their business.

Coinage in Japan.—During September -Y-20 gold pieces to the amount of -Y-4,900,000 and 20-*sen* silver pieces to the value of -Y-990,601 were struck at the Osaka Mint.

Japan Share Market.—The share market of Japan is again very active, spinning and other stocks generally rising. This activity is ascribed to the depression in the demand for money.

Arnhold, Karberg & Co.—It is announced that Messrs. Arnhold, Karberg & Co. have removed the offices of their Berlin branch from 75, Unter der Linden, to No. 7, in the same street.

Ex-Seoul-Fusan Railway Company.—At a recent general meeting of the shareholders of the ex-Seoul-Fusan Railway Company, held in Tokyo, a dividend at the rate of 6 per cent *per annum* was declared.

Fixed Bank Deposits, Japan.—The leading banks of Osaka and Kobé have agreed to lower the interest on fixed deposits to 5 per cent. Interest on current and special currency amounts remains unchanged.

Proposed Sugar Monopoly, Japan.—It is reported that the Department of Finance at Tokyo has decided to abandon the proposed scheme of making the sugar refinery industry of Japan a Government monopoly.

Osaka Sugar Refining Company.—The directors of the Osaka Sugar Refining Company have resigned in a body in consequence of the disagreement with shareholders regarding the heavy loss sustained on the last half year's working.

Honan-Ningpo Railway.—The Honan-Ningpo Railway has decided to raise a domestic loan by October next year, and repay the £700,000 which was defrayed by the British-Chinese Corporation for the construction of the line.

Artesian Well Towers and Tanks, Bangkok.—Messrs. Howarth Erskine, Ltd., of Singapore have received orders from the Siam Government for the construction of two steel towers with tanks, to be erected over artesian bores at Bangkok.

Chinese Emigration to Canada.—The $500 gold Canadian tax on Chinese immigrants is causing a scarcity of unskilled labor at Victoria, B. C. The salmon canners there are petitioning for a reduced head tax, in order to permit Chinese to enter the province.

Japan's Bamboo Trade.—The Japanese foreign trade in bamboo and bamboo work, particularly with the United States, has been extremely active during the last three months, large orders being placed at prices considerably higher than those of a year ago.

British Mails to Hongkong.—The Canadian Pacific Railway Company is boasting that it has accomplished the feat of landing British mails in Hongkong in 29 days from their dispatch from London, or nearly a week less than the previous record.

Hongkong Government's Typhoon Losses.—It is estimated that the damages suffered by the Government of Hongkong during the recent typhoon will amount to at least $125,000. This is a very small amount as compared with the damages sustained by private firms and individuals in the colony.

Hokkaido Hemp Company.—This company has increased its capital from -Y-1,200,000 to -Y-2,400,000, for the purpose of improving the looms of its manufactory and establishing factories in the vicinity of Tokyo. The new shares will be distributed among the present stockholders *pro rata*.

Kobu Railway Transfer.—A general meeting of the Kobu Railway was held recently at Tokyo, and the chairman announced that the price of the transfer of the line to the Government was roughly estimated at -Y-13,200,000. The directors were appointed to be administrators after the nationalization of the railway.

Rubber Promotion, Malaya.—A company has been founded at Amsterdam with a capital of 3,000,000 Dutch gulden, to undertake the cultivation of rubber in the Malay Peninsula. The name is *La Société Anonyme des Plantations réunies d'Hevea des Terres de Bila*, and the promoters are the Banque de L'Union Parisienne.

Otaru Lumber Company.—At the organization meeting of this company in Tokyo, Baron Shibusawa, the chairman, nominated the following directors and auditors:—Directors, Messrs. S. Tanaka (Managing), K. Okura, C. Uyemura, T. Hayakawa and K. Yamashita; auditors, Messrs. Asaba, W. Sekiya and C. Matsumoto.

Sumatra and Borneo Tobacco.—The import of Sumatra tobacco into the United States for the first seven months of the current year amounts to 28,033 bales against 29,394 in 1905, and 27,565 in 1904. A noteworthy feature of Borneo's tobacco trade for the same period was the purchase of her tobacco for the first time in America.

Tobacco Crop of Japan.—The weather in Japan has been very favorable for the tobacco crop this year and the growth of the plants is very satisfactory throughout the empire. The total harvest is estimated at 12,839,980 *kwamme*, or 106,571,800 lbs., and the net profit to the Government-monopoly office -Y-32,000,000, or approximately $16,000,000 gold.

Tokyo Electric Company.—This company, it is reported, is about to increase its capital from -Y-400,000 to -Y-1,600,000, and to extend its operations to manufacturing electric gloves as well as other electric apparatus, with the assistance of the General Electric Company of America, in order to supply these articles both at home and abroad in the Far East.

Formosa's Foreign Trade.—Formosa's total imports for the calendar year 1905 amounted to $12,223,855 gold and exports to $12,183,323, an increase of $1,350,695 in imports and $823,987 in exports over those of 1904. Of imports $5,481,939 gold were foreign products and $6,741,917 the produce of Japan. The exports to foreign countries were valued at $5,352,573 gold and to Japan $6,830,750.

Hokkaido Colliery Railway Company's Loan.—The *Japan Chronicle* says that the foreign loan of -Y-1,-000,000 raised by the Hokkaido Colliery Railway Company has been invested in both branches of the company's business—the colliery and railway. The Government and the company will be jointly responsible for the loan after the purchase by the former of the company's railway business.

Zinc Smelting Works, Japan.—A zinc smelting works is to be established in Japan. Experts will be invited from Europe, and the factory will be built in the neighborhood of Tokyo. The capacity of this works is to smelt 50 tons of zinc ore a day and the capital is to be -Y-3,000,000. The principal idea of the promoters is to find markets in China and Korea. Up to the present time all the zinc ore has been exported.

Siam's Teak Industry.—The teak industry of Siam is being interfered with by the stealing of elephants. The teak trade there is practically monopolized by four firms, three British and one Danish, and large numbers of elephants are employed in the forests in shifting the logs. These huge beasts are big propositions for kidnapping, yet three firms report the loss in 1905 of 33 animals, worth $35,000 gold. Recovery of a stolen animal is rare.

China's New Canning Industry.—A larger import of tin plates by China is accounted for by the establishment at Kiungchau (Hoihow) of a native cannery, which is going to pack lichees and pineapples in tins for export during the coming season. A considerable stock of tins has already been manufactured locally, and, to judge from appearances, they are little, if at all, inferior to those turned out by the large foreign canneries, though the process is somewhat primitive and laborious.

Provincial Buildings, Philippine Islands.—The Philippine Commission has appropriated the following sums of money as loans to the respective provinces for the construction of Government buildings:—Province of Albay, ₱35,000; Province of Tayabas, ₱60,000; Province of Rizal, ₱75,000, and Province of La Laguna, ₱60,000. It is understood that all this work must be let by public contract and that reinforced concrete will be the material used in the construction.

Methodist Episcopal Church, Manila.—R. M. Loper has secured the contract for the construction of a large reinforced concrete edifice for the Methodist Episcopal congregation of Manila. It will be the largest Protestant church in the Islands, and when entirely completed will cost ₱75,000. It is intended for the native branch of the denomination and will have a seating capacity of 1,400. The extreme dimensions will be 82x93′. There will be a gallery on three sides of the auditorium, with a seating capacity of 500.

Machine Tools in China.—In the past there has been a small demand in China for high grade tools for iron working, but the Chinese are stirring themselves. Mining is being carried on as never before. A great steel plant is in operation at Hankow, from which pig iron is being shipped to Mexico, and quantities are being shipped to Japan constantly. The company is arranging to complete the plant, so that it will be capable in the future of turning out 1,000 tons of steel per day. In a few years, with the aid of the railways, China is bound to become a very large market for machine tools of all kinds.

Heavy Silver Purchases by India.—Early in June the Indian Government announced that henceforth the $52,000,000 gold reserve fund, which is now mainly held in London in securities, would be called the gold-standard reserve fund. Silver purchases have since been large, and it is understood that, as the Government intends in future to hold a much larger stock of silver at all times than it has in the past, there may be gradually accumulated a surplus stock of about 10,000,000 rupees (rupee, 32 cents gold), upon which it will draw only in case of emergency when its otherwise large purchases would cause an undue advance in the price of the metal. Through the accumulation of large surplus reserves in silver the Indian Government will be enabled to carry out a policy of conducting its purchases regularly over the whole 12 months, thus avoiding the necessity of buying during periods of active trade.

Manila Railway Shares.—The issue of the recent circular (published in the October number of The Far Eastern Review) respecting the Manila Railway has made the 6 per cent debentures rise, without any particular business. Debenture stockholders have not received any interest for 15 years, though their rights have been preserved, both in respect to capital and the arrears of interest, which amount to 90 per cent. If they insist on their pound of flesh, there is no reason why they should not maintain their present interest of 6 per cent, and demand the capitalization of their arrears at the full face value, as the consideration for transferring the line to an American corporation (the Manila Railroad Company). However, suggests a contemporary, the situation lends itself to a reasonable compromise, and a way out of the difficulty may be found by replacing the present 6 per cent debentures by 4 per cent bonds, giving holders £190 of these for every £100 old stock. These *fours* should easily earn their full interest, and be worth, say, 80 per cent, equivalent to £152 for each £100 of present stock. Certainly the debenture holders will be foolish to accept illiberal treatment, after exercising so much patience.—*The London and China Express.*

Chinese Engineering and Mining Company, Ltd.—The annual general meeting of this company, the head offices of which are at Tientsin, was held in London, October 26th, 1906, when the directors' report and accounts for the financial year ended February 28th, was submitted. According to this report the net result of the year's transactions shows a balance to the credit of profit and loss account of £142,646, made up as follows:—Net profit, after providing for all charges in China, £178,580; add balance brought forward from last year (£8,199) and gross receipts in London (£4,268)—total £12,467—the total net profit is £191,047. Deduct expenditures in Europe, for salaries, stores, etc. (£6,368), interest on debentures (£25,783), redemption of debentures (£10,000); directors' fees (£3,230), and legal expenses estimated at £3,000—total £142,646—leaves a net balance of £142,646. The directors recommended the appropriation of this sum as follows:—To reserve for depreciation (making a total reserve of £110,000), £30,000; payment of final divident of 1s 0d per share (free from tax) payable November 2d, 1906, £50,000 (making a dividend of 10 per cent for the year with the interim dividend of 1s per share, paid May 1st, 1906, £50,000); carrying forward to new year's account £12,646.

NOTIFICATION

TENDERS will be received at the office of the undersigned until 12 o'clock on Saturday, February 10th, 1907, for the construction of a reinforced concrete wharf 1170 feet in length, containing approximately 150,000 lineal feet of reinforced concrete piling, and 180,000 cubic feet of superstructure; four reinforced concrete 4-storey godowns, each 300 feet by 100 feet; a transit shed, and other works.

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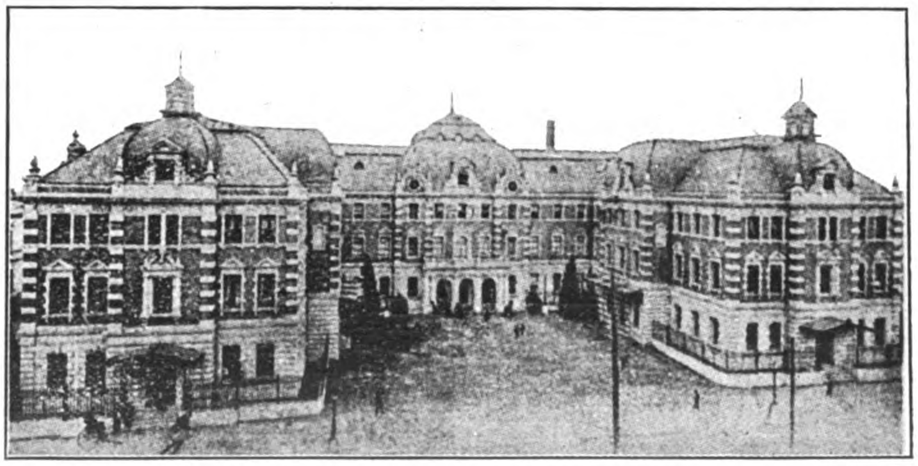

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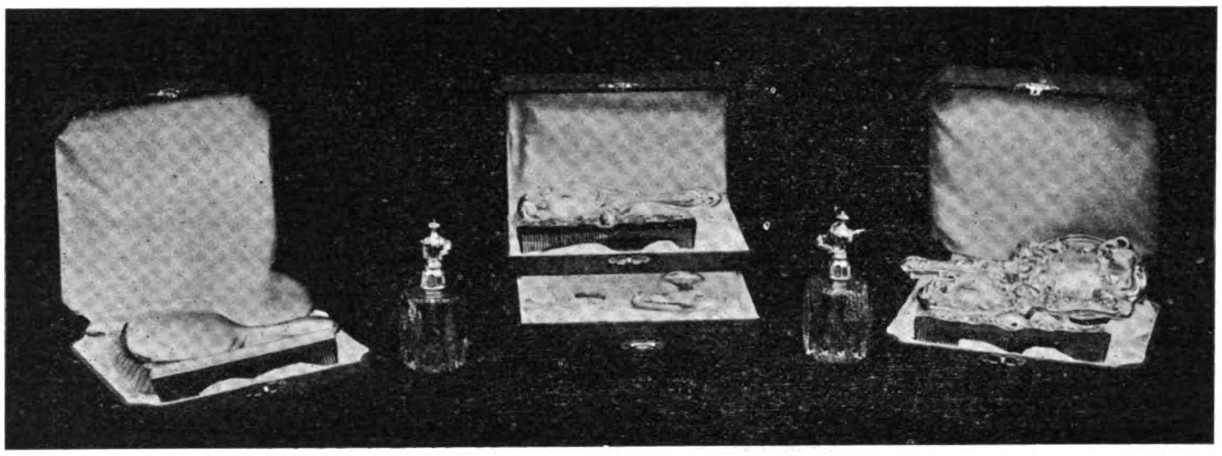

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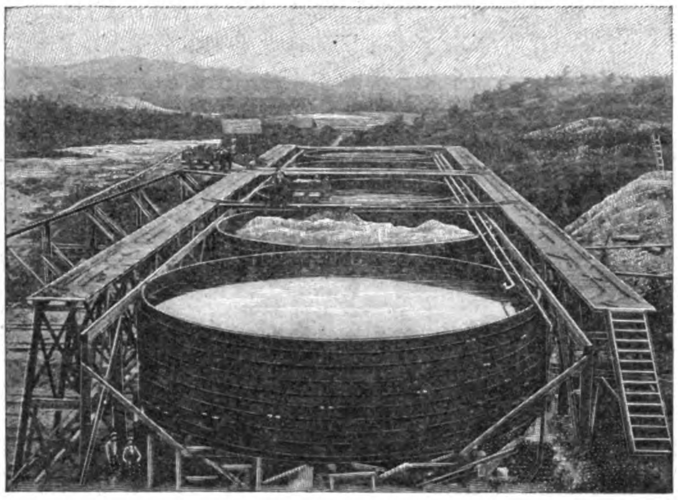

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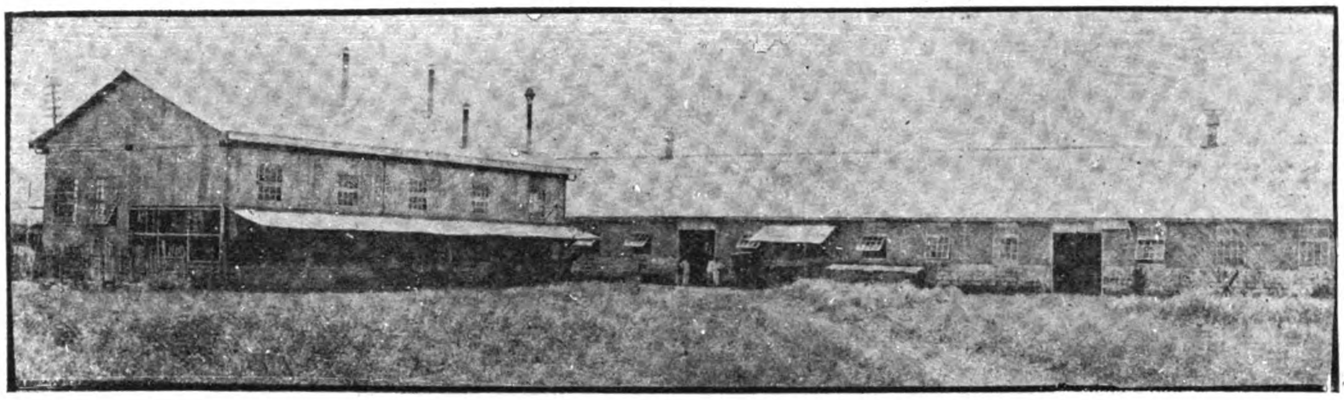

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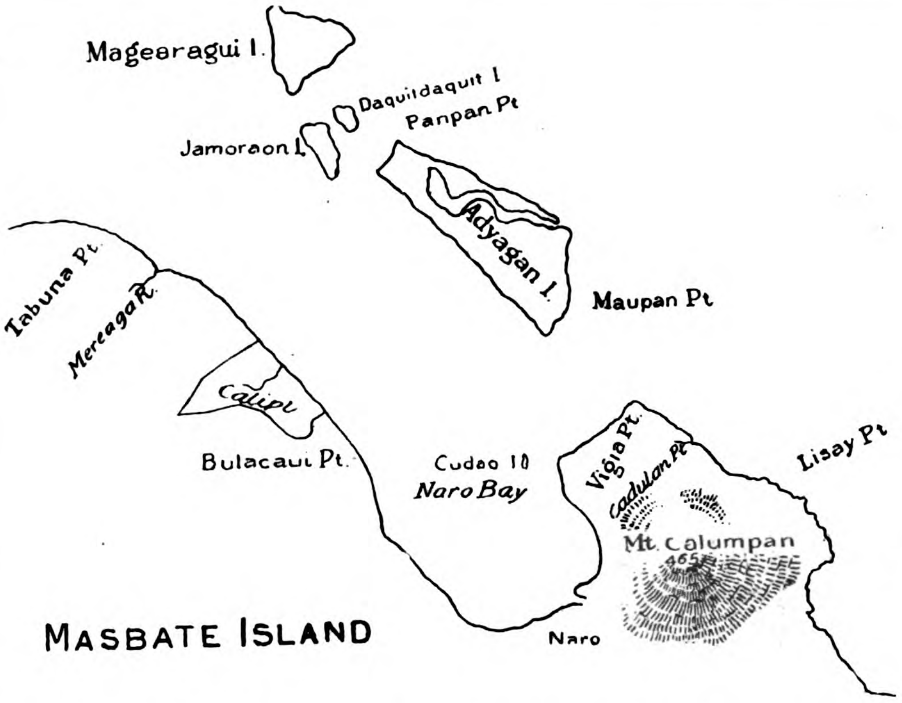

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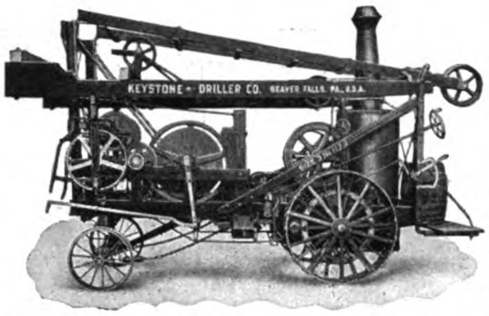

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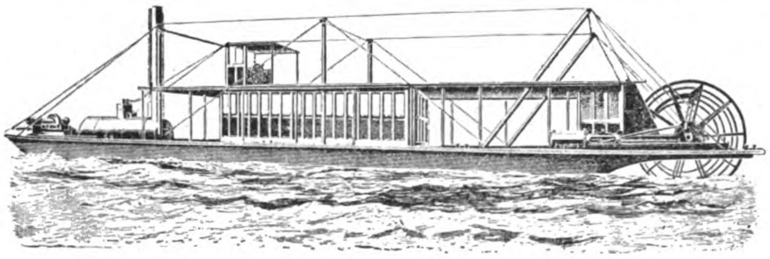

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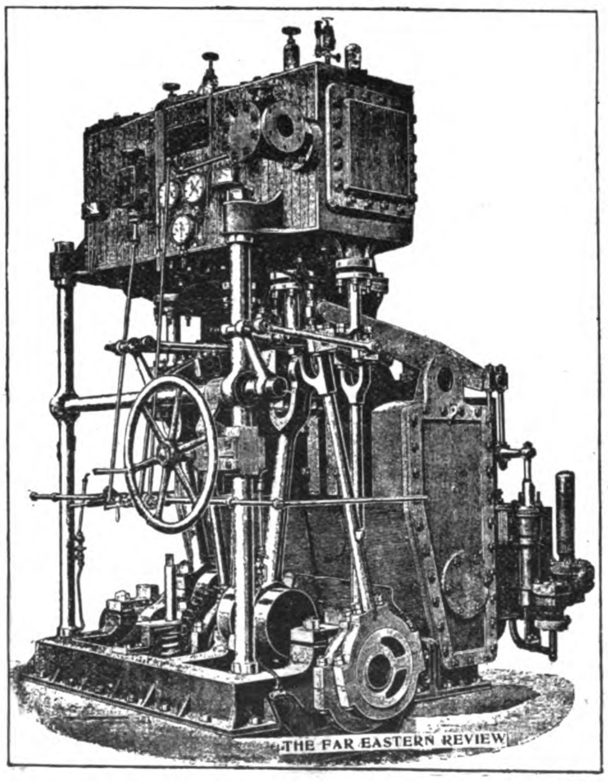

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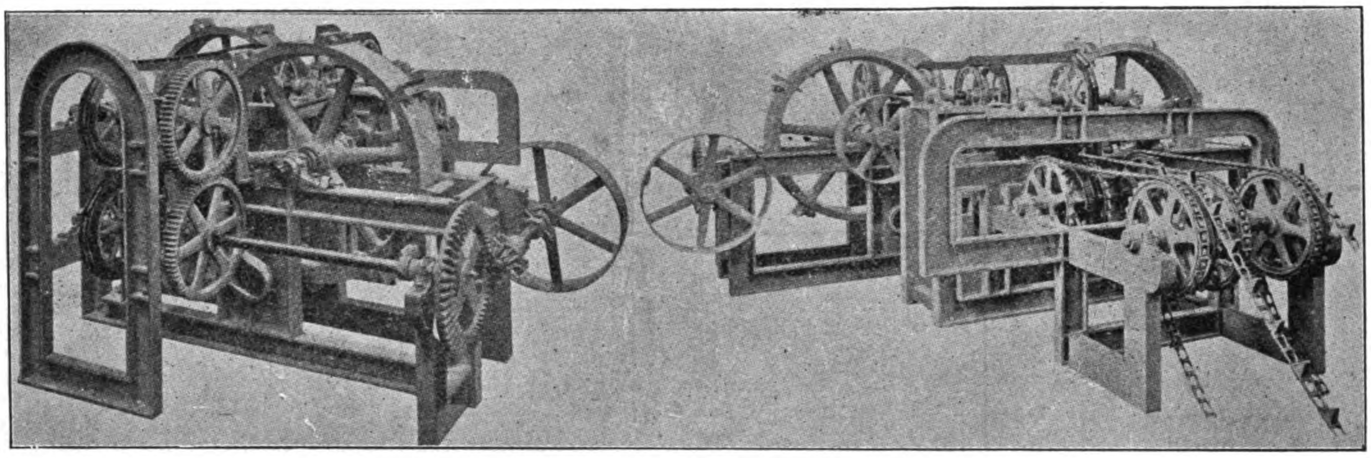

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THE FAR EASTERN REVIEW

COMMERCE ⊛ ENGINEERING ⊛ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, JANUARY, 1907. No. 8.

METHODS AND PRACTICE IN THE DESIGN OF REINFORCED CONCRETE

With Special Reference to Tropical Conditions in the Orient

(By J. C. KOCH, Assistant Engineer, Bureau of Public Works, Manila)

[*The practical design of arches and notes on reinforced concrete construction will be the subject of a second paper by Mr. Koch, which will appear in the February number of* THE REVIEW.—EDITOR'S NOTE.]

The limits of this paper forbid a complete discussion and comparison of the various theories and methods of calculation in the design of reinforced concrete structures, its main purpose being to set forth briefly and clearly the methods employed by the writer to meet conditions in the Philippines, with special reference to the design of beams, floor-slabs, T-beams and arches.

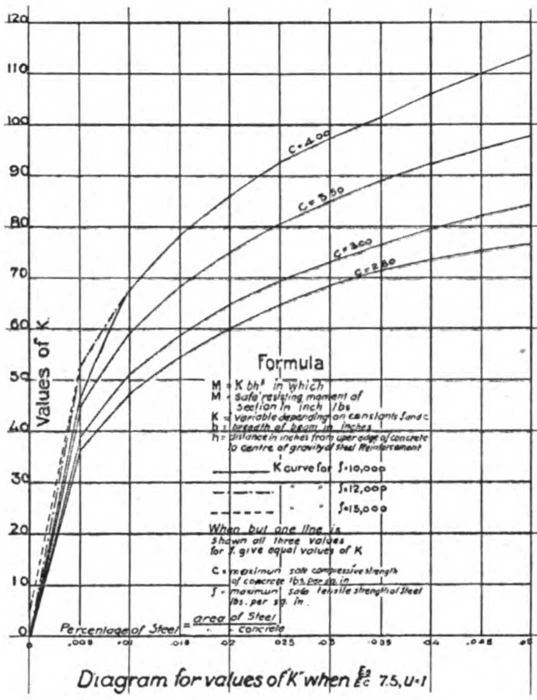

Diagram for values of K' when $\frac{E_s}{E_c}$ 7.5, u=1

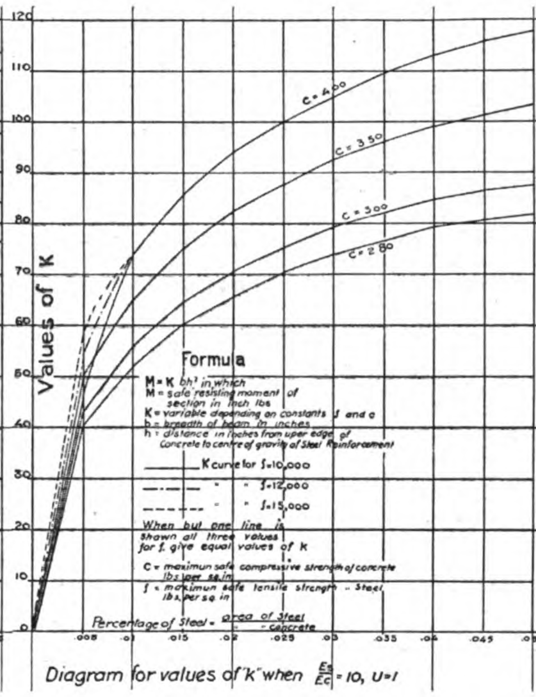

Diagram for values of K' when $\frac{E_s}{E_c}$ = 10, u=1

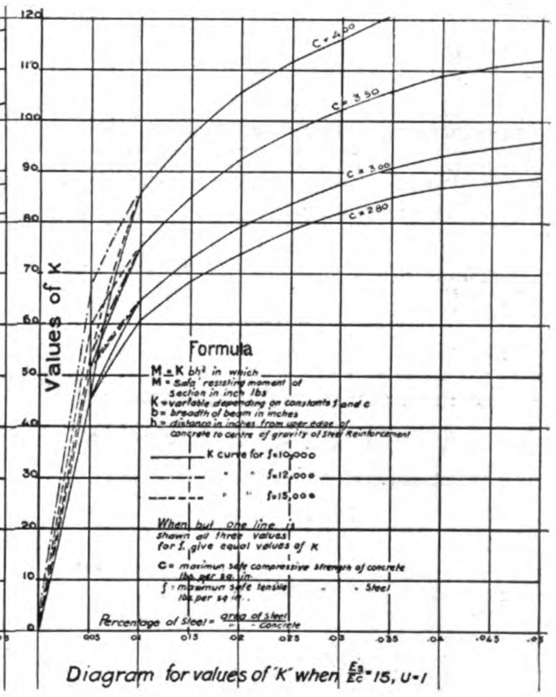

Diagram for values of K' when $\frac{E_s}{E_c}$ = 15, u=1

The conditions prevailing in the Philippine Islands and practically throughout the Tropics, the alternating wet and dry seasons, destructive insects, luxuriant vegetation and high humidity, render the use of timber commercially available not only expensive, but in such exposed structures as bridges, really dangerous. In a structure where the wood is not exposed to the weather the white ant and other insects may eat into the wood and weaken it enough to render it unsafe in a few years. The few varieties of wood proof against these insects cost from $100 to $150 gold per 1,000′ board measure, and the supply is limited.

The stone commonly used for building purposes is usually a very poor, soft limestone called *adhobie* which often is about as expensive as concrete.

Steel constructions, unprotected, rust rapidly unless carefully painted about every two years, and as they are of comparatively short life in the Tropics even when carefully painted they cannot be considered as permanent work.

In the quest for a permanent building material concrete was considered and used to some extent by the Spaniards, but plain concrete, up until a decade ago, was rather expensive and until the price of cement was reduced, its use in the Philippines was extremely limited. But with the advent of cheap cement and cheap steel there was ushered into the field of construction a new material combining permanence with flexibility of application.

Usually the terms *concrete-steel* and *steel-concrete* are used interchangeably and equivalent in meaning to reinforced concrete. Sometimes a distinction is made in using the term steel-concrete to apply to constructions of steel and concrete in which the concrete does not serve any other purpose than that of protecting the steel from rust and rendering it more thoroughly fire-proof. In the construction of river-walls and cut-stone bridges there are many examples of steel bars being used to tie adjacent stones together to secure additional strength. The same principle is employed in reinforced concrete or concrete-steel as it is sometimes called. The advantage gained is that the steel is embedded in the body of the concrete and protected from the weather. Use is also made of the adhesion between the steel and the concrete to make the entire mass act as a homogeneous material. In beams the fibers of the upper half are in compression and those of the lower half are in tension. The compressive resistance of concrete is about 10 times its tensile resistance while steel has practically the same strength in compression or tension. Steel will carry in compression about 40 times as much load as an equal section of concrete, and in tension steel will carry about 350 times as much load as an equal section of concrete. The cost of steel is about 50 times the cost of an equal volume of concrete. So that for a given load in compression concrete will cost only about four-fifths as much as steel. But in tension to carry a given load with concrete would cost about seven times as much as to carry it with steel. By combining these materials so the concrete carries compressive load and the steel tensile loads greater economy is obtained than by using either material alone. One of the most important advantages gained by such a combination is the absolute protection of the steel against corrosion. Numerous cases are on record proving conclusively that the protection of the steel by concrete is perfect.

When properly designed, reinforced concrete is an economical material for floors, girders, walls, arches and almost every class of building construction.

Natural and slag cements do not make suitable concrete for reinforced concrete. The only class of cement that should be used for such work is a good grade of Portland having a tensile strength neat per square inch at the end of seven days of not less than 450 lbs.

A number of tests of briquettes made of a class of sand frequently used for concrete throughout the islands gave the following results:—Briquettes, 1 part cement, 3 parts sand, water 12.5 per cent of weight of cement and sand, at end of eight days, compressive strength per sq. in. 715 lbs., tensile strength same age

(Continued on page 242.)

THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.

PUBLISHER AND EDITOR

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MANILA, SHANGHAI AND YOKOHAMA, JANUARY 1907

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FREE ENTRY FOR RAILWAY MATERIAL

Under the act of the Philippine Commission which granted the franchises to the White and Speyer syndicates for the construction of certain railroads in the Islands, provision is made for the duty-free entry of all material required for building and operating purposes. As to direct importations by the engineering contractors to the Philippine Railway Company and by the Manila Railroad Company, the law is clear enough; but whether duty-paid stocks in the stores of the local hardware merchants, or those held in bond by these same merchants, can be construed to come in for the benefits of the act is a question which Commissioner Forbes, Secretary of Commerce and Police, now has under consideration. We have discussed this phase of the matter with several firms and we believe there is much merit in the position they have assumed. We believe they should be allowed to compete for this business with other markets of the Orient which are supplying the railways with large quantities of small material that the local firms have on hand, but whose prices the latter are not able to meet or underquote on account of the tariff wall. With this obstacle removed, they claim that they will be able to compete on a most satisfactory basis for the trade. We know of one Manila firm that brought over from the United States in anticipation of this very business a stock of small railway material and construction implements valued at $100,000 gold. These goods were placed in a bonded warehouse and there they remain because the firm is unable to compete with the Hongkong and Singapore markets, from which places large shipments of material are constantly coming into the Philippines duty-free. If the Government, however, will so amend the tariff clause of the act as to give the firm an opportunity to enter the competition it will be in position to do business It seems to us only fair that local merchants should be allowed to sell these goods they have in bond, to the railroad companies, on the original invoices under which they were imported and with all the benefits of the duty-free clause of the law; and where other goods on which duties have already been paid are carried in stock and sold from the store shelves to the railroad builders the Government should make refunds of the duties already imposed. The local merchants claim that with these concessions from the Government they will be able to meet the foreign competition and by so doing keep at home large sums of money that are now being diverted to other nearby markets. Those in charge of the railway construction would be perfectly willing to place these orders in the Manila market—prices being lower or even as low as those quoted elsewhere—because they would be assured of prompt delivery when the demand for material is immediate. In the interest of the merchants the Commission should give this question the favorable consideration which we believe its importance to the local commercial field demands. The Manila merchants who are interested should bring all their combined influence to bear to the end that the Commission may clearly see the justice of their contention and the far-reaching benefits to be derived by the Islands in keeping as much of this railroad money at home as possible. We are all beginning to regard these railway enterprises as our own private concern, and it is due to us that we should derive every financial benefit from them that their construction offers. We are the people who later on will have to make them a commercial success, so whatever comes to us in the shape of patronage during their construction will of necessity be returned to the companies a hundredfold in times to come.

LUMBERING IN THE PHILIPPINES

Other pages of this issue of THE REVIEW are devoted to data regarding mechanical tests, properties, and uses of thirty Philippine woods; and the sawmills, lumber market and prices in these insular possessions. The facts thus set forth are of importance to other tropical countries of the Orient, because what they establish along general lines relative to the forestry of the Philippines may, in large measure, be used as the basis of similar studies elsewhere. Many of the woods under consideration abound in other countries and dependencies of the Far East, so that the conclusions arrived at here would be reached after a careful study of the timbers that grow in the forests of other tropical possessions in this section of the world.

With reference to the opportunities for lumbering in the Philippines, Major George P. Ahern, U. S. Army, Director of Forestry, gives some interesting data. The Philippine public forests cover an area of more than 40,000,000 acres, while less than 500,000 acres of forest are held by private owners. Under an act of Congress in 1902 the Philippine forests can not be sold, leased, or homesteaded unless they are more valuable for agriculture than for forest purposes. Exclusive licenses may be granted for terms up to 20 years, and these give the holders the sole right to exploit certain forest products. The extent of the territory thus granted depends upon the size of the plant to be installed. No charge is made for such a license and only stumpage charges are imposed. These charges range from ₱0.50 to ₱2.50 per cubic meter, or approximately from $1 to $5 gold per 1,000′ b. m. Such an arrangement is believed to be preferable to buying the land, since no land taxes are incurred. There are no export duties on timber or on the manufactured product, and logs imported into the United States are admitted free. The import duty at Manila on sawmill and logging machinery is 5 per cent *ad valorem*. Freight rates from Manila to the Pacific Coast amount to $7 gold per ton (logs), about 40 cubic feet, or $12 to $14 gold per 1,000′ b. m., or $8 per ton of 40 cubic feet; light-weight material, $5 per 40 cubic feet. The distances to market are as follows:—

Distance from—	Manila.	Cebu.	Iloilo.	Hongkong	Shanghai.	Sydney.
	Miles	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*
Seattle, U. S. A.	6,400	......	......	6,300	6,200	6,800
Cadiz, Negros Occidental	400	140	70	800	1,200	3,370
Bongabon, Mindoro	200	......	......	700	1,200	3,570

The amount of lumber used in the Philippine Islands per year is approximately 100,000,000 board feet. The amount of American pine used in China during the past year was 85,000,000 board feet, and that used in Australia during the same period 63,000,000 board feet. Common Philippine timber as good as American pine can be laid down at tide water for about the same price as pine on the Pacific Coast. Difference in freight rates, low stumpage, and cheap labor should combine to make a low rate on the manufactured Philippine product in the Chinese and Australian markets and should gradually replace the American product.

The actual stand of timber on tracts in Negros and Mindoro shows 10,000 to 32,000 board feet per acre. The lower slopes of Mount Silay in Northern Negros are practically covered with merchantable timber over 20″ in diameter. A large area of similar forest on Mount Silay adjoins this tract and awaits the lumberman. In the southwestern part of this province (Negros Occidental) is a large area of valuable forest which will be close to the southern terminus of the new railway that is not under construction. There are a number of regions in the Philippines where dense forests of valuable timber are found which have never been exploited for the market. The Agusan Valley, in Mindanao, 4,000 square miles in area, is almost entirely covered with virgin forests and drained by large streams. The dense forests on the east coast of Mindanao are also unexploited.

Labor for this industry is not difficult to secure. The wages range from ₱0.50 to ₱1.50 ($0.25 to $0.75 gold) per day. Filipinos are apt at handling machines of all kinds and work satisfactorily when treated with consideration. Skilled loggers and lumbermen, assisted by Filipino crews, should get out logs and manufactured material at prices not far from those quoted for pine on the Pacific Coast, especially in regions where we find 30,000 board feet of merchantable timber on each acre close to tide water, and where no special logging difficulties are encountered.

Logging is carried on during the entire year in many of the provinces. In some places it is suspended during the seasons of heaviest rains, a period of from two to four months. The present logging methods are very crude. Many of the native woods will float, and, if handled by the expert raftsmen of the Pacific Coast, could be rafted 200 to 600 miles through the quiet inland seas to Manila, and possibly to China.

No lumbering enterprise, however, should be attempted in the Philippines unless the company intends to handle the product from start to finish, including transportation, lumber-yards at the principal markets, supply stores for use of the employés in the forest, etc. This would probably involve the employment of not less than $200,000 gold.

JAPANESE AND INDIAN COAL MARKETS

Japan is at present India's only real competitor in the coal markets of the Far East; but considering the difference in the extent of the coalfields of India and those of Japan, it is reasonable to conclude that the day is not far off when India will control the Oriental coal markets. The conclusion is based on the fact that Japan has but 6,000 square miles of coalfields. Her present annual output is about 10,000,000 tons, which is in excess of the Indian mines, but this is a small tonnage compared with what India is capable of producing. The latter has the coal, abundant cheap labor, and the capital; also convenient water transportation to the sea. The hauls by rail are short and comparatively inexpensive. This service is being supplied as rapidly as possible to meet the demands of the inland trade.

In referring to the coal future, the Chief Inspector of Mines for India observes that the chief need for a sound development of the Indian coalfields is improvement in superintendence and working capacity of the miner. The methods of working the mines are crude and unscientific, and this results in not only a smaller output than should be expected but also in a great waste. To overcome this condition the Government of India has established a college, which has a large attendance, at Sibpore, for the scientific training of native engineers with special reference to coal-mining. It is believed that the classes at this institution will furnish the needed skilled assistants to foreign superintendents.

The Indian miner performs work underground much as the Indian laborer does on top of the ground. Whatever kind of labor he undertakes he brings to it an easy-going manner and bone and muscle that are far inferior to that of the English miner or the miners of America. In fact, he accomplishes less than half the results of the western miner. He has not the physique, having inherited small bones, light muscles, and an *easy way* from his ancestors. It is believed, however, that he is growing stronger and becoming more capable, and that in time the coal miners of India will by heredity become almost equal to coal miners anywhere, at least to those of Japan.

In connection with Indian coal-mining, the American Consul-General at Calcutta says there is one thing to be deplored, and that is the employment of women in and about the mines as laborers. Some of these coolie women are said to walk 5 miles a day in the performance of their work, and carry on their heads loads of 80 lbs. half that distance. There is a strong sentiment growing against this sort of drudgery for women, but indications are it will be a long time before the Indian women will be delivered from such toil. Yet this practice of employing female labor in mines is not confined to India alone. The mines of China and Japan employ their quota of coolie women, who labor day in and day out alongside their husbands turning out as much work in many cases as their stronger and huskier liegelord ever thought of doing. It has not been so many years since women and children were rescued from such drudgery in other countries, but such a reform in the countries of the Orient appears to be far off at the present.

In Calcutta, the capital of India, the coolie women carry bricks and mortar on their heads and climb bamboo ladders to the third and fourth stories of buildings as helpers to coolie masons. They carry on their heads burdens seemingly large enough to bend the backs of bullocks and donkeys. Even girls of 8 and 10 years of age carrying loads on their heads weighing 50 lbs. and more and trudge along under the sun's intense rays with the mercury rising to 100 degrees in the shade. Yet neither is this an unusual condition in other parts of the Orient. The coolie women of China till the soil, work on the railroads and other construction enterprises, clean the public streets, and on the rivers furnish fully three-fourths of the sampan and light junk labor. In many parts of Japan and Manchuria this identical social condition prevails, in many of the seaports of the former country the women adding to their sphere in the field of labor the coaling of vessels with baskets.

Another fact about female labor which appeals to reformation is that the women receive only about one-half the pay of the men. No matter how hard they work nor how long the hours —a day usually means from sunrise to sunset— the wage is the same, and a mere trifle at that. Throughout China the male laborer will receive on an average $0.20, Mexican currency, *per diem*, while the female on the same job and accomplishing an equal amount of labor gets $0.10 Mexican currency a day. This rule seems to be general throughout the Orient, and while it means a large saving of money for the employer in a year it seems to carry with it a certain inhumanity that can not appeal to the western favorably.

MANILA RAILWAY COMPANY, LTD.

Elsewhere in this issue appear the details of the reorganization scheme of the British directors of the Manila Railway Company, Ltd., which the shareholders in that corporation have adopted. An interesting feature of the report is the announcement that Mr. Horace L. Higgins, who has been the moving spirit of the Manila & Dagupan Railway since its inception, has accepted the office of President and General Manager of the Manila Railroad Company, the American concern which takes over the interests of the British Company in the Philippines, and in addition will build and operate the new railway lines on the Island of Luzon for which Messrs. Speyer & Co., of New York, are the original concessionaires under Government franchise. Mr. Higgins is regarded by the American engineers who have assembled here to expand other large railway projects a most valuable advisor in many of the difficulties that are met with here in connection with railroad building. This high esteem is not confined to the engineers alone, but it is shared with an abiding confidence by the Government of the Philippine Islands which not infrequently calls upon Mr. Higgins for advice and guidance over knotty railway problems. The distinguished favor which Mr. Higgins always enjoyed in the conduct of the affairs of the Manila Railway Company, Ltd., was his best recommendation to the Speyer Syndicate. Judging from his thorough knowledge of local conditions, his large engineering ability, and his keen conception of the task in hand together with his well-known sagacious business ability, we feel safe in the opinion that the interests of the Manila Railroad Company will be promoted by its new President and General Manager. Mr. Higgins is not making much ado over the progress of his new construction work on Luzon, but his forces are accomplishing results along all routes of extension.

The reconstruction scheme of the Manila Railway Company, Ltd., provides for the adjustment of the various claims of the British interests against the Washington and Philippine governments, and, at the same time, will put the company upon what, it is asserted, will be a paying basis. The concession held by the old company from the Spanish Government has given place to the concession from the American Government to the new company, which is described as being more favorable in several respects, besides which the concession includes powers for the construction of many additional miles of railway. In their circular the directors say that when the plan is fully carried out the position as regards the railroad system will be that, instead of being operated under a concession for a limited period, at the expiration of which the property would revert to the Government, it will have the benefit of the unlimited concession, or perpetual franchise; also of a very substantial reduction in taxation, while the menace of a claim on the part of the Government under the terms of the old Spanish concession to a share in the net earnings will be removed. The directors have confidently recommended to the shareholders and the various security holders the scheme they propose, believing that it affords the best, if not the only, solution of the many difficulties which have confronted the company. And they add that, however content under the improved conditions of their property the security holders might be to continue without any change in their position, it is practically impossible for them to do so without sacrificing very substantial benefits which are now obtainable.

CHINESE ENGINEERING AND MINING COMPANY, LTD.

According to *The Celestial Empire* the fifth annual meeting of the Chinese Engineering and Mining Company, Ltd., shows that great improvement has been made as to the position and standing of the company, and it shows also that arrangements have been made for largely increasing the output of coal at the Kaiping mines. The chief features of the financial year of the company are that it has been able to maintain the dividend of 10 per cent, to make ample reserves, reducing the debenture issue by the sum of £10,500. The debenture issue has now been reduced by £78,540 from its original £500,000. The demand for the company's coal has been fully maintained, but there has been a diminution in the output. The situation throughout the year has been that the company has been unable to keep pace with the demands for coal, and that consequently it has been working without any margin in the way of stock. Three years ago the stock of coal had risen to such a large extent that the company was anxious to reduce it. The best proof of the progress of the company is the development of its business, and the best augury for the future is that notwithstanding the fact that the output during the year under review was considerably larger than it was a few years since, it was practically sold out at the end of the year, and the demand for coal was practically in excess of the supply. The gross profit and loss for the year is £178,580, which shows a reduction of £25,000 compared with the previous year. This is due to the diminished output and the consequent diminution of the sales and also to the somewhat increased cost of production, but the reduction does not cause the directors any misgiving, as it was of a transient nature and the results for the year are satisfactory.

The total profits for the year amount to £144,447, out of which £10,000 were expended for the redemption of debentures and £30,000 were carried to the reserve for depreciation account, which bring up the reserve to £110,000. The balance remaining, £104,447, with £8,199 brought forward from the previous year, make an available total of £112,646. One shilling per share was paid on May 1st as an interim dividend, and 1s. on November 2d, making 10 per cent for the year, leaving a balance of £12,646 to be carried forward to next year's account. The company has to the credit of reserve for depreciation account £110,000 to the credit of reserve for the redemption of debentures £31,666, and to the credit of exchange account £43,272, making a total of about £185,000.

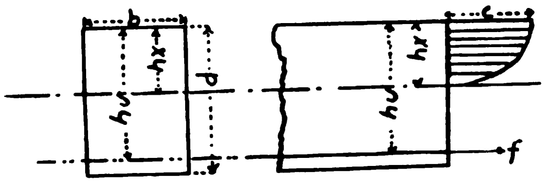


Fig. 1.

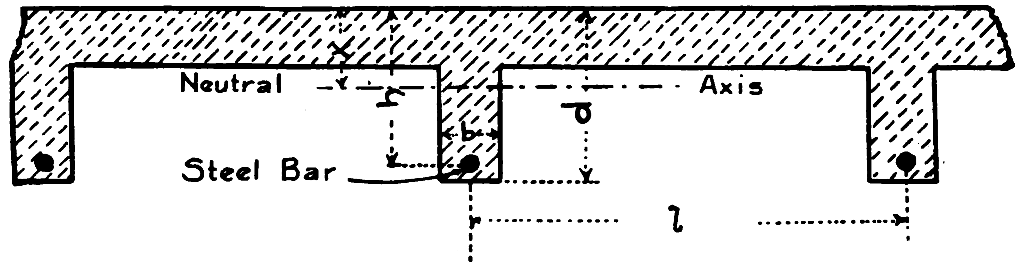


Fig. 2

METHODS AND PRACTICE IN THE DESIGN OF REINFORCED CONCRETE

(Continued from page 239.)

125 lbs. per sq. in. For standard No. 20 quartz briquettes of same age and proportions the compression strength per sq. in. was 1590 lbs. and the tensile strength 243 lbs. per sq. in. The conditions under which all these briquettes were made were uniform throughout. The sand used in the above tests was a very fine material containing about 3 per cent of earthy matter. About 50 per cent of this sand passed a No. 40 sieve and 98 per cent passed a No. 30 sieve. If possible all sand samples should be graded. If practically all the grains are finer than No. 30 and about the same size it should not be used, or if used, it should be mixed with a coarser sand so that not more than 30 per cent of the grains are of any one size. Of course the sand should be clean and sharp, though it is usually difficult to get sharp sand in most localities.

These tests also tend to show that the materials in use in some parts of the Philippines are inferior to those commonly used in reinforced concrete work in the United States. The high constants in use in the United States in the design of reinforced concrete have been found too high for the class of workmanship and materials usually encountered in the Philippine Islands. For this reason the writer proposes the use of constants much lower than those ordinarily used in the United States.

In designing any important work tests in tension and compression should be made of briquettes made of the same sand and cement as is proposed to be used in the actual construction and not more than one-fifth of the ultimate strengths at the end of 30 days should be taken as the safe working stress.

In the absence of suitable compression testing apparatus the briquettes should be tested in tension and the safe compressive strength taken at not more than 10 times the safe tensile strength at the end of 30 days.

CONSTANTS.—The writer proposes the following constants for use unless direct tests show that higher ones may be used safely. All constants are based on concrete 30 days old and safety factor of 5:—

1-2-4 concrete in tension 30-40 lbs. per sq. in.

1-3-6 concrete in tension 28-35 lbs. per sq. in.

Shearing strength of concrete 40-60 lbs. per sq. in.

1-2-4 concrete in compression 300-400 lbs. per sq. in.

1-3-6 concrete in compression 280-350 lbs. per sq. in.

Mild steel in tension 12,000 lbs. per sq. in.

Modulus of elasticity of 1-2-4 concrete 2,500,000.

Modulus of elasticity of 1-3-6 concrete 2,000,000.

Modulus of elasticity of steel 29,000,000.

Ultimate strength of steel 57,000 and 65,000 lbs. per sq. in.

Elastic limit of steel 55 per cent of ultimate strength.

Safe working adhesion between concrete and steel 40-80 lbs. per sq. in. of metallic surface.

The small range of temperature makes it unnecessary to provide for temperature stresses in ordinary structures.

DESIGN OF BEAMS.—The steps in the proper design of a beam should be taken in the following order:—(1) Determination of maximum bending moment due to external loads; (2) computation of section needed to resist such bending moments with the required factor of safety. Computation of bending moment due to weight of beam itself and increase of section if necessary; (3) the determination of longitudinal shear between the steel and concrete and provision of mechanical bond if safe adhesive strength is exceeded; (4) the determination of vertical shear and introduction of properly located shear-bars if the safe shearing strength of the concrete at any point is exceeded.

FORMULAS.—The rapid extension of the use of reinforced concrete in the past few years has resulted in the development of many formulas for the design of the various parts of such structures. The most economical use of reinforced concrete members being in positions when they are subject to transverse stresses, as in beams and floor slabs, most of the formulas are for beam design. Many of these formulas are based on more or less rational theory while others are absolutely empirical. As with most empirical formulas, the empirical formulas in use for the design of reinforced concrete are quite simple in form and application. As they contain constants which to a large extent offset the manifest errors in the assumptions upon which they are based, they are in quite extensive use. In experienced hands empirical rules do not usually lead to disastrous consequences.

The rational formulas appear rather complicated and forbidding and for that reason are not used as widely as they should be. The formulas used by the writer for more than two years in the design of beams admits of greater flexibility in conforming to the conditions prevailing here, and combine the advantages of being based on rational theory and of simpler form than most of the empirical formulas. It is quite evident that an empirical formula based on concrete having an ultimate strength in compression of 2,500 lbs. per sq. in. at the end of one month will have no application in a region where average concrete will have an ultimate compressive strength of from 1600 to 2000 lbs. per sq. in. at the same age. For this reason it is urged that all empirical formulas based on the high constants in use elsewhere be abandoned in the design of structures in the oriental Tropics where materials are usually so much inferior to those commonly used in the United States.

The theory is that given by Prof. W. K. Hatt of Purdue University after a long series of authoritative tests on reinforced concrete beams (*Eng. News*, Feb. 27, July 17, 1902). Quoting from this article, "the important fact is the increased extensibility of reinforced concrete in tension. Thus while plain concrete broke with an average extension of 1:7000 the reinforced concrete broke with an average extension of 1:1400. The effect of the reinforcement probably is to distribute the maximum elongation over the entire length of the beam, whereas in the case of plain concrete the maximum elongation is confined to the fractured section."

This analysis assumes a parabolic distribution of stress for compression in the concrete (based on numerous stress-strain diagrams), and a position of the neutral axis depending upon the ratio of the area of steel to that of concrete.

The theory is developed from the following assumptions:—(1) Sections plane before bending remain plane surfaces and hence the distor-

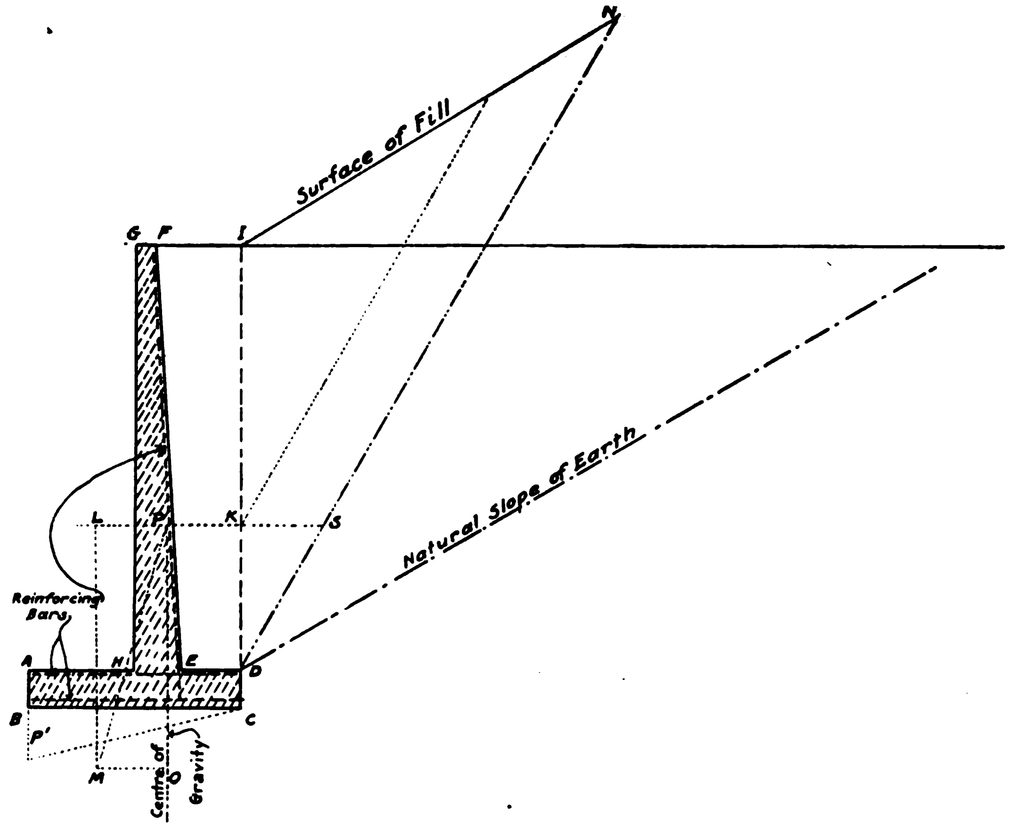
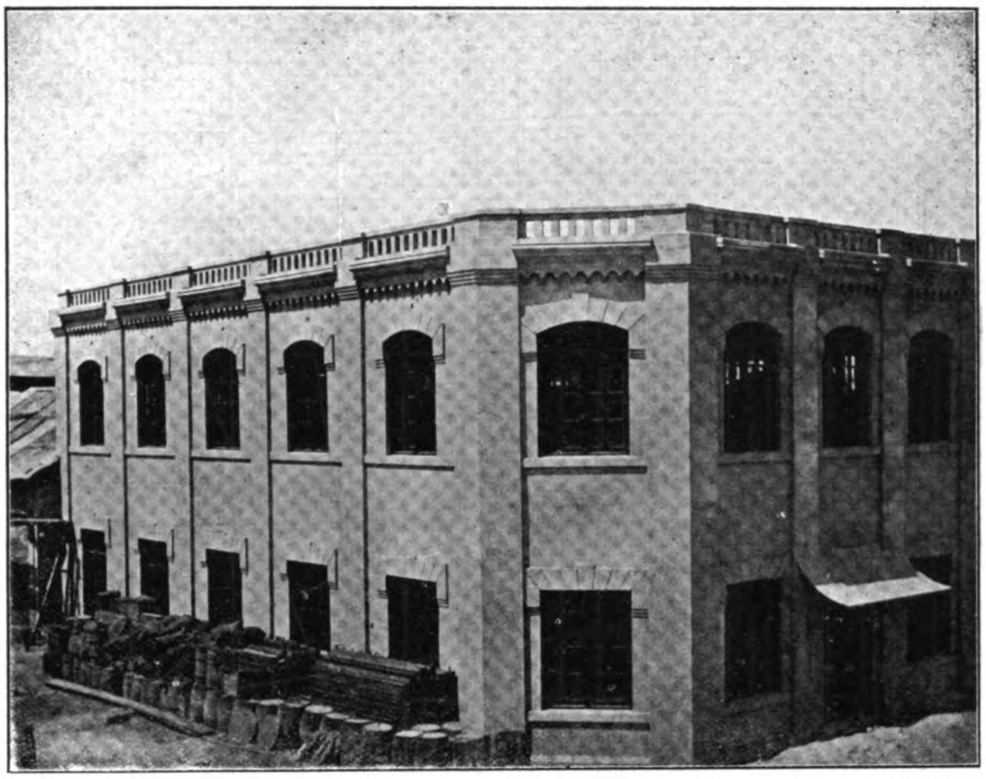


Fig. 3



REINFORCED CONCRETE BUILDING IN MANILA CONSTRUCTED BY THE ATLANTIC, GULF AND PACIFIC COMPANY

tion of any fiber is proportional to its distance from the neutral axis; (2) external loads are perpendicular to the neutral surface; (3) the values of moduli of elasticity obtained in direct tension and compression apply to steel and concrete when under stress in beams; (4) there is no slipping between the concrete and the metal; (5) the concrete is stressed in compression only and the steel in tension only; (6) there are no initial stresses in the beam due to contraction, removing forms before concrete has set thoroughly, etc.

In *Fig.* 1:—

Let d=total height of the beam in inches.
- b=breadth of beam in inches.
- h=distance from the center of the steel reinforcement to the upper edge of the concrete, in inches.
- hx=distance of compression face from neutral axis, in inches.
- u=1, then hu=h.
- p=ratio of area of steel to area of concrete $\frac{As}{Ac}$
- c=maximum safe compressive stress in extreme fiber of concrete.
- f=maximum safe compressive strength of steel in tension.
- Es and Ec=moduli of elasticity of steel and of concrete in tension and compression, respectively.
- M=bending moment or resisting moment.
- As=total area of steel in square inches.
- Ac= b h.

Since the steel takes tension only and the concrete compression only equating the tensile and compressive forces we have:—

$$\tfrac{2}{3} c x = p f \qquad (1)$$

From the first assumption we have

$$\frac{c}{Ec} : \frac{f}{Es} : : h\ x : h\ (u\text{-}x)$$

and substituting equation (1) becomes

$$\tfrac{2}{3} x^2 = \frac{Es}{Ec} (u\text{-}x)\ p \text{ from which}$$

$$x = -\tfrac{3}{4} \frac{Es}{Ec} p + \sqrt{\tfrac{3}{2} \frac{Es}{Ec} p \left(u + \tfrac{3}{8} \frac{Es}{Ec} p\right)} \qquad (2)$$

Then taking moments around the neutral axis the resisting moment is

$$M = b\,h^2 \left(\frac{5}{12} c\,x^2 + p\,f\,(u\text{-}x)\right) \qquad (3)$$

By an ingenious method proposed by Prof. L. J. Johnson (see "The Design of the Steel-Concrete Work of the Harvard Stadium," *Journal of the Association of Engineering Societies*, for June, 1904), the formulas given can be greatly simplified.

If the values of c and f from equation (1) are substituted alternately in equation (3) the latter becomes

$$M = \tfrac{2}{3} cx\,(u - \tfrac{3}{8} x)\ b\,h^2 \text{ if allowable stress in concrete is assumed.} \qquad (4)$$

$$M = pf\,(u - \tfrac{3}{8} x)\ b\,h^2 \text{ if allowable stress in steel is assumed.}$$

Prof. Johnson then replaces the coefficient of b h^2 in equation (4) by "K," a numerical coefficient depending, for a given u and $\frac{Es}{Ec}$, simply on the steel percentage and can be taken from a table, or a diagram whose ordinates are the values of "K" and whose abscissae are values of p; the values of c, f and $\frac{Es}{Ec}$ being assumed constant.

Since we have taken u=1, and adopting the simplified form we have the following formulas for practical application:—

$$\tfrac{2}{3} cx = p\,f \qquad (5)$$

$$X = -\tfrac{3}{4} \frac{Es}{Ec} p + \sqrt{\tfrac{3}{2} \frac{Es}{Ec} p \left(1 + \tfrac{3}{8} \frac{Es}{Ec} p\right)} \qquad (6)$$

$$M = K\ b\ h^2 \qquad (7)$$

In equation (7)

$$\left.\begin{aligned} K &= \tfrac{2}{3}\ c\,x\,(1 - \tfrac{3}{8} x) \\ \text{or } K &= p\,f\,(1 - \tfrac{3}{8} x) \end{aligned}\right\} \qquad (8)$$

depending upon whether the allowable safe unit stress for concrete or steel is assumed. If certain safe unit stresses for c and f are assumed and substituted in equation (8) the smaller value of K should always be taken, because the value of neither f nor c should be exceeded in equation (5), and whichever value of f or c gives the smaller value for either term of (5) should be used for solving for K in equation (8).

The constants to be assumed are p, $\frac{Es}{Ec}$, c and f. The value of p is optional, though the writer's experience has been that the most economical beams (concrete costing in place from ₱14 to ₱20 per cu. yd. and steel from ₱0.04 to ₱0.06 per lb.) have a ratio of area of steel to area of concrete of from 0.015 to 0.0125.

DIAGRAMS.—To facilitate the use of the formulas discussed above three diagrams have been prepared for obtaining easily and quickly the values of K for values of $\frac{Es}{Ec}$ of 7.5, 10.0 and 15.0 and each of these diagrams will give the correct values of K for c=280, 300, 350 and 400 and each of these for values of f=10,000, 12,000 and 15,000.

It will be noted that in all cases when the value of p=0.01 or greater the curves for f=10,000, 12,000 and 15,000 coincide. This is due to the fact that when p is greater than 0.01 the full safe strength of the steel cannot be utilized without exceeding the maximum safe unit stress in the concrete.

The depth h obtained by using the formulas is the distance from the upper edge of the concrete to the centre of the steel reinforcing rods. If there are two rows of bars h is taken as the distance from the upper edge of the concrete to the centre of gravity of the reinforcing. A safe rule for proportioning beams is to make d, the total depth of the beam, equal to h plus twice the diameter of the bars used for reinforcement.

EXAMPLE:—What is the safe uniformly distributed load with a safety factor of 5 that a beam 13.5" deep and 12" wide will carry in addition to its own weight, the clear span being 14', the diameter of reinforcing bars being ¾" and $\frac{As}{Ac}$ = 0.015, ultimate strength of concrete being 2.000 lbs. per sq. in.

For a factor of safety of 5 we take

$$c = \frac{2000}{5} = 400$$

$$f = \frac{60{,}000}{5} = 12{,}000$$

Since the total depth of beam is 13.5", the distance from the upper edge of concrete to center of reinforcement should be 13.5—2 (¾) = 12.0"

This gives us the values

b=12"

h=12"

From our knowledge of the concrete to be used suppose we decide $\frac{Es}{Ec}$ for this particular case to be equal to 15.

From the diagram for $\frac{Es}{Ec}$=15 we find, following the curve for c=400 and f=12,000 and noting its intersection with the ordinate though p=0.015 we find a value of K=97.

Substituting this in formula (7) we have the safe resisting moment of the beam to be

$M = 97\ b\ h^2$ inch-pounds

$= 97\ (12)^3$ inch-pounds

=13,968 foot-pounds (A)

M for a uniformly distributed load of w per foot, the clear span of beam in feet being l, is

$$M = \frac{w\,l^2}{8}$$

Since l=14

$$M = \frac{196\ w}{8} = 24.5\ w \qquad (B)$$

Equating A and B

24.5 w=13.968

w=570 lbs. approximately.

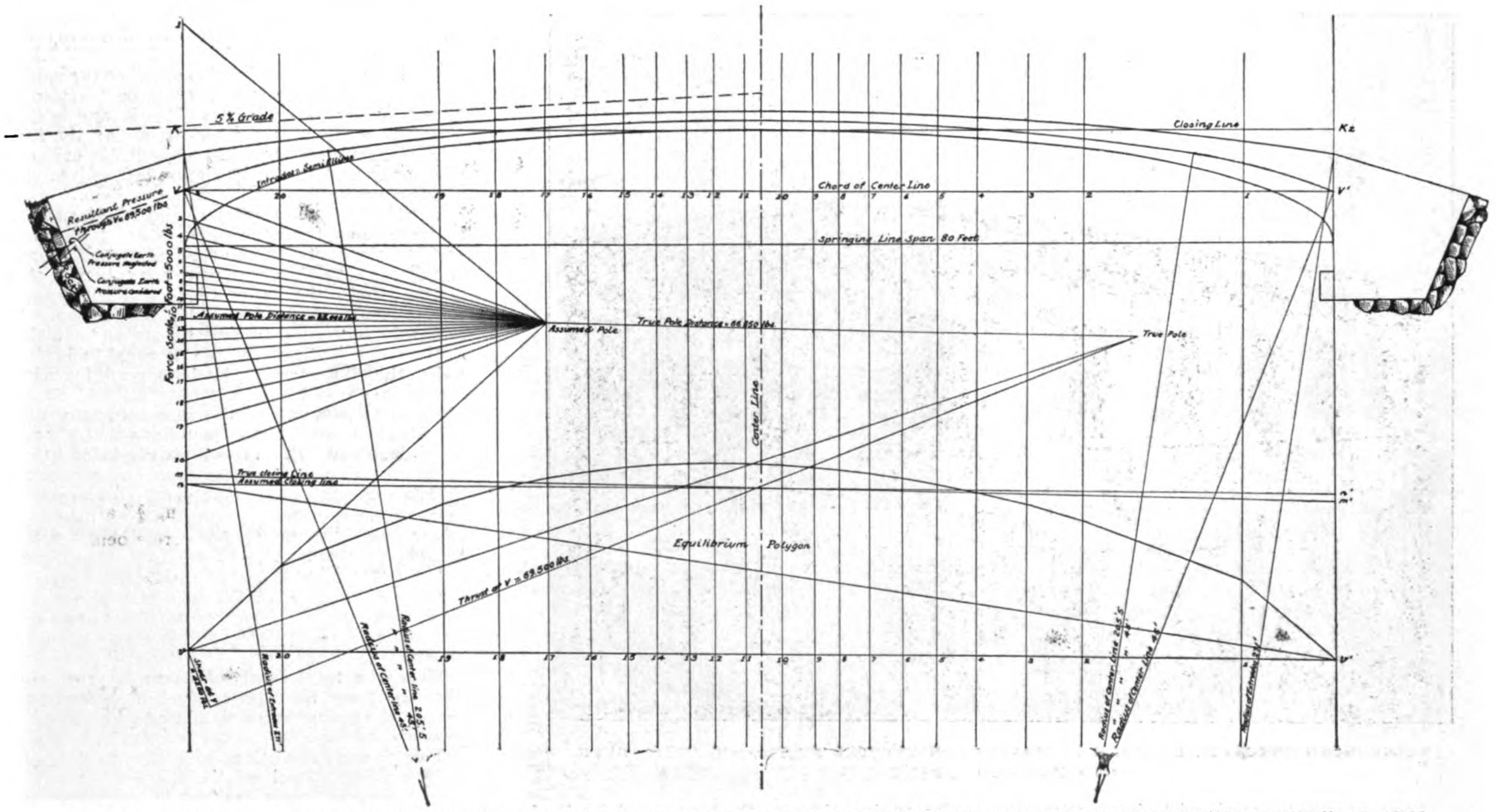
Since the section of the beam is approximately 1.12 sq. ft. in area, the weight of the beam per foot is about 160 lbs. Subtracting this from 570 we have the safe uniformly distributed load per foot of beam=410 lbs. or a total load on the beam of 5,740 exclusive of its own weight.

If $\frac{Es}{Ec}$ had been taken at 7.5 the total safe extraneous load, all other constants being unchanged, would have been 4,200 lbs. If $\frac{Es}{Ec}$ had been taken equal to 10 the total safe extraneous load would have been 4830 lbs.

In the design of beams when the loads are given and it is required to find the proper section of beam the inverse process is followed. Find K as before, the maximum bending moment due to extraneous loads is calculated and reduced to inch-pounds, and equated to K b h^2. If b is assumed a certain part of h say ½ h the equation becomes

Safe bending moment in inch-pounds=K $\frac{h^3}{2}$

K being known from the diagram h is found readily. To the value of h as found add twice the diameter of steel bars used for reinforcement and thus obtain the total depth, d, of the beam; and as b was assumed a part of h, when h is determined b is also known.



GRAPHIC DIAGRAM OF ELASTIC METHOD FOR AN 80′ HIGHWAY SPAN, SEMI-ELLIPTICAL INTRADOS AND THREE CENTERED NEUTRAL AXIS

In the problem just solved the area of steel will be

$.015\ (12\times 12)=2.16$ sq. in.

This will require $\frac{2.16}{.44}=5$ bars $\frac{3}{4}''$ diameter.

The spacing will be $\frac{12''}{5}=2\frac{1}{2}''$ c. to c.

FOOTINGS.—Footings for continuous walls may be economically designed in reinforced concrete. In such cases the reinforcement is placed at right angles to the horizontal axis of the wall. The maximum thickness of the footing slab will be just under the wall proper and from this thickness it will taper down to a thickness of 4 or 5″ at the extreme edges. The method of proportioning footings is to compute the pressure per sq. ft. that the soil under footing will receive, and then compute the maximum bending moment that will be exerted on the footing by treating it as a cantilever beam carrying uniform load (this being the upward thrust of the soil). The formulas and diagrams for simple beams given in a preceding section apply here and also in the case of column footings.

In column footings bars should be placed at right angles to each other and parallel to both axes of the footing (if footing is rectangular). It is sometimes advisable to place diagonal bars also if the footing is very large. The footing should be designed as a cantilever beam carrying a uniform load equal to the pressure on the soil under footing. The proper area of steel for each of the two sections (sections taken perpendicular to steel bars) should be taken at 0.0075 of the area of concrete above center of gravity of steel reinforcement. The thickness of the slab should vary uniformly from a maximum (determined by simple beam formulas or diagrams) immediately under the column to about one-half or one-third this thickness at the outer edges.

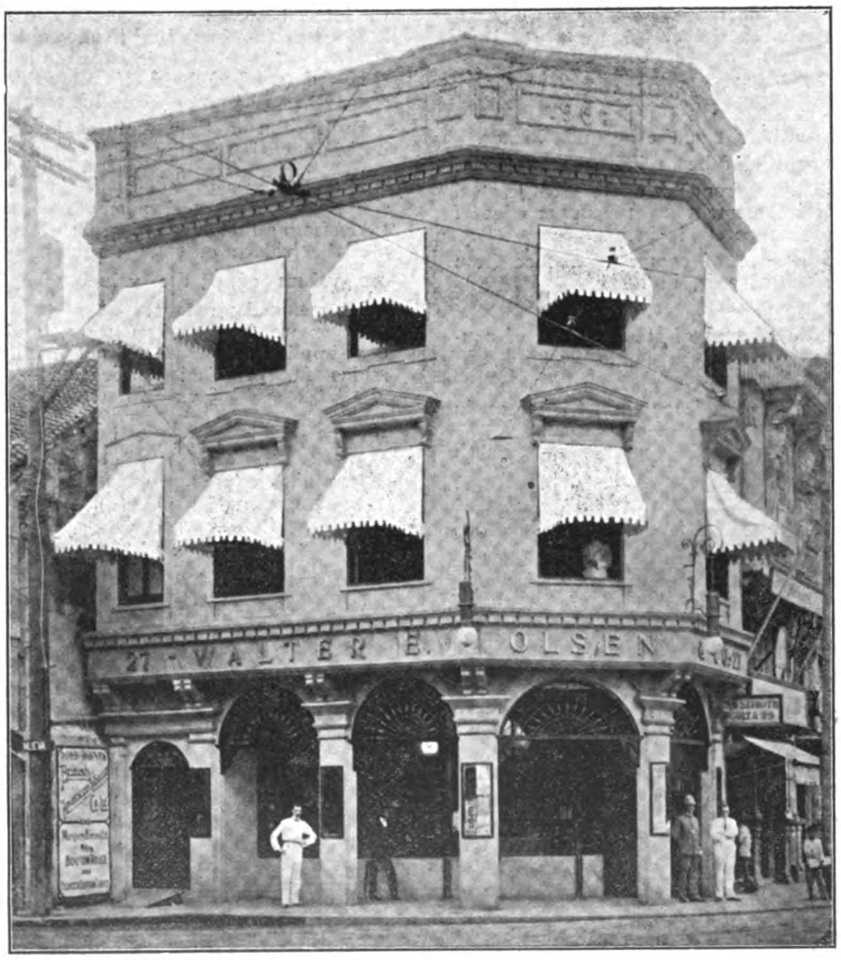
LONGITUDINAL SHEAR.—Cases may arise when the shear between the steel and concrete exceeds the safe working adhesive strength. To determine this we have the following formula from Prof. W. H. Burr's *Resistance of Materials.*

Let fc = the stress in the concrete in the plane of the center of the reinforcing, at the distance h (*Fig.* 1) from the upper edge of the concrete.

I = moment of inertia of section.

p = perimeter of steel reinforcement.

k = intensity of shear on the surface between the steel and the concrete.



FRONT ELEVATION OF THE OLSEN BUILDING, ESCOLTA, MANILA; CONSTRUCTED OF REINFORCED CONCRETE BY THE MANILA CONSTRUCTION COMPANY

F = total transverse shear at the given section.
fs = the intensity of stress in the steel.

$$k = \frac{Es}{Ec} \div F.\ As\ .\ V \div I\ p. \qquad (9)$$

If k exceeds a value of 60 a mechanical bond must be secured between the steel and concrete. This may be effected by using Thacher, Kahn or twisted bars, or increasing the surface of the steel rods by substituting bars of smaller diameter, or by attaching stirrups vertically or inclined at 45° to the main bars. The form of stirrup advocated by the author is that of a U shape with hooks or loops at the ends. Placed in position the hooks or loops should engage the main bars in the lower part of the beam and be inclined toward the nearer support. The cross bar of the U should lie within an inch or so of the top of the beam. The spacing of these stirrups should be not greater than the depth of the beam. The diameters of U bars should not be less than one-half the diameter of main bars. No originality is claimed for this form of providing for longitudinal shear.

VERTICAL SHEAR.—This is one of the most unsatisfactory phases of reinforced concrete design. The great number of tests made give only conflicting evidence as to the manner in which beams should be designed to provide adequately for it.

If the vertical shear due to maximum safe load produces at any section a greater shearing stress than the safe working shearing stress (40-60 lbs. per sq. in.) longitudinal bars are introduced in the upper part of the beam and as far from the upper edge of the concrete as the main lower bars are from the lower edge of the concrete. In addition U bars, as described in the section under longitudinal shear, are so placed that the U bar acts as a mechanical tie between the upper and lower longitudinal bars. These upper longitudinal bars extend only over the portion of the beam where the safe working shearing stress is exceeded.

REINFORCEMENT.—The reinforcement should always be placed so that the distance from the center of gravity of the entire steel reinforcement to the upper edge of the concrete is not less than h. The distance from the centre of gravity of the steel to the lower edge of the concrete should never be less than two diameters of the bars used, and no portion of a steel bar should be nearer to the lower edge of concrete than 1½ diameters.

The spacing centre to centre of the steel bars should, if possible, not be greater than 8 diameters, nor less than 3 diameters.

FLOOR SLABS.—The calculations for the design of floor slabs will be identical with those for beams, a foot width of slab being treated as the unit.

It does not often happen that longitudinal shear is so large in floor slabs as to require provision for it. In such cases the longitudinal shear might be provided for as in the case of beams. Usually a transverse steel reinforcement of one-third or one-fourth the area in the longitudinal section is more than sufficient to take up longitudinal shear, if the transverse bars are fastened, by wiring, to the longitudinal bars. A minimum depth of 4″ is used for slabs.

T-BEAMS.—In a floor system of reinforced concrete the floor slabs are usually supported by beams, also of reinforced concrete, which are made monolithic with the floor slabs so that the effective depth of the beams is equal to the thickness of the floor slab plus the depth of the beam below the slab.

In addition to this, the concrete in the slab acts as an upper flange of the beam forming a T section.

There is no standard practice in the design of such sections and few tests have been made that would indicate how much of the slab really acts as a compression flange of the T beams. The tests demonstrate clearly that a T section is much stronger than a rectangular section whose total depth is the same and whose width is that of the lower part of the T section.

Referring to *Fig.* 2, which is a typical T-beam section the whole construction being monolithic, the writer proposes a method which is believed to be conservative and give results that are safe. The method proposed is amply safe, as compared

OLSEN BUILDING IN COURSE OF CONSTRUCTION

with other methods which assume that the slab acts as an upper compression flange for a distance both ways from the center of the beam equal to ½ l, and that this whole flange area is in compression.

In *Fig.* 2 b is the total width of the beam. Assume that the slab acts as a flange only for a distance of 1½ b from the center of the T section, making a total effective flange width of 3 b.

Let t = thickness of floor slab.

Then the area of concrete above the reinforcement is

$$b\ h + 2\ b\ t = Ac.$$

Substituting this value of Ac for the value b h in formula (8) we have

$$M = K\ h\ (bh + 2bt) \qquad (10)$$

Since the slab is always designed first, the value of t is known, and if b is taken as a fractional part of h the only unknown term wil be h.

Compute, as in any beam design, the maximum bending moment due to dead and live load, decide on the constants c, f, p and Es ÷ Ec and from the diagram take off a value of K corresponding to the constants assumed and treat as in the case of the simple beam for which the formulas have already been derived.

EXAMPLE.—Suppose t = 4″, b = 12″ and c = 300, f = 12,000, Es ÷ Ec = 7.5 and the total maximum bending moment is 50,000 foot-pounds. What depth of beam is necessary to carry the given load?

Assume a value for p of 0.015 which has been found a fairly economical one for this region and in the diagram the value of K is found to be about 59. Since in formula (9) the bending moment is expressed in inch-pounds we have

$$M = 600{,}000 = 59h\ [12h + 24\ (4)]$$
$$708h^2 + 570lh = 600{,}000$$

From which we have approximately.

$$h = 25.2''$$

For the value of d add twice the diameter of the reinforcing bars to the value of h just found. For shear, vertical and longitudinal, use the same treatment as for simple beams. Practically all that has been given in the design of simple beams will apply as well to T-beams.

RETAINING WALLS.—By treating the retaining wall as a beam subject to a transverse load often-times considerable economy may be found in using reinforced concrete in such construction. If in *Fig.* 3, A B C D be considered as a base monolithic with respect to E F G H and capable of resisting the bending moment at the section H E, exerted upon it by the pressure of the earth against E F G H, which acts as a cantilever, we may proceed to compute the bending moment at H E due to such pressure and eventually design the base so that it will not only take the bending moment safely, but also distribute the load on the foundation so that the safe bearing power of the soil will not be exceeded. Another point to be considered is that the weight of the earth in the verticals through E and D acts on the heel of the retaining wall thus balancing part of the pressure brought to bear upon the wall.

Let Py be the pressure of the earth acting at a height above the base of one-third the height of the wall. Let X be the height D I and w the weight of a cu. ft. of the earth backing. If the angle of repose is equal to that of the surface of the fill we have the well-known formula

$$Py = \frac{wX^2}{2} \cos \Phi.$$

Φ being the angle of repose of the earth. For a horizontal fill we have

$$Py = \frac{wX^2}{2} \quad \frac{1 - \sin\ \Phi}{1\ \ \sin\ \Phi}$$

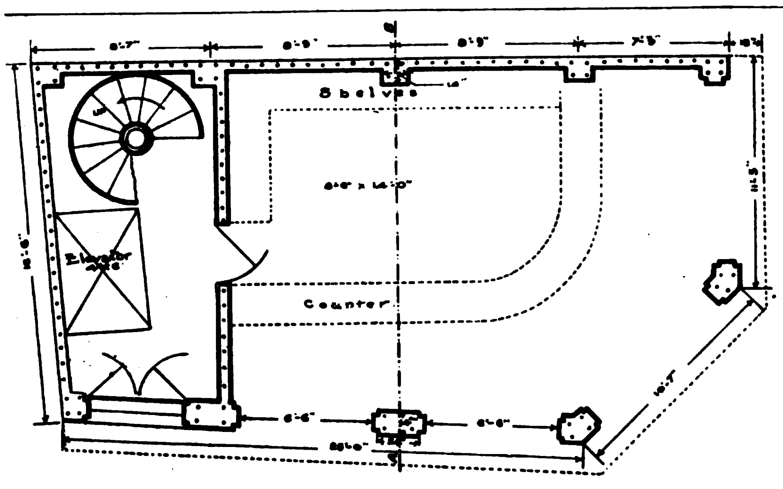
These formulas appear in a number of textbooks and no development of them is here attempted.

In any given problem assume the weight of the material to be placed behind the wall, and determine the natural slope of such material; 30° is a slope that will suit a great many cases and when at all doubtful even smaller values of Φ may be used.

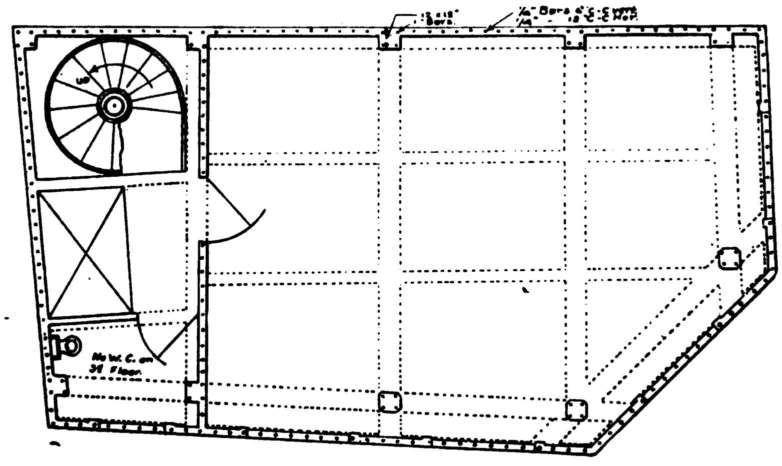
From this data substitute values in the formulas just stated and determine the value of Py. Py acts at an angle to the vertical equal to ½(90°—Φ). It will be found most convenient to compute component P, the horizontal component of Py, graphically.

This found, the bending moment at section H E is obtained by multiplying P by $\frac{X}{3}$. The thickness of the base H E is determined as in the case of a simple beam. Then assume a base whose thickness is equal to H E and whose length, A D, is equal to one-half the height G I. H should be at the middle of A D. Find the center of gravity of the section A B C D E F G. H combined with the prism of earth included between E F D I.

Pass a line O through the center of gravity thus found and find the resultant of the combined vertical pressure through O and the horizontal pressure P, plot the resultant and note its intersection with the base. It should pass within



FIRST FLOOR PLAN OF THE OLSEN BUILDING



SECOND AND THIRD FLOOR PLAN OF OLSEN BUILDING

the middle third, though if just outside the middle third, and the safe bearing power of the soil is not exceeded the design will be safe. If W′ is the vertical component of the resultant pressure, s is the distance from the center of gravity line and the point in which P M cuts the line B C, and r is the length B C, we have from mechanics, the maximum intensity of pressure on the base will be at the outer edge of the toe B equal to

$$p' = (W' \div r) + (W's \div \frac{r^2}{6})$$

and the minimum pressure will be at the point c and equal to

$$q = (W' \div r) - (W's \div \frac{r^2}{6})$$

If s is greater than $\frac{r}{6}$, q will be negative and the heel D C will have a tendency to rise.

If the ultimate bearing power of the soil under the toe, A B, is exceeded the heel will go up and the wall will fail.

The reinforcement in the base will be found as in a simple beam after the loads are finally determined. The reinforcement in the upper part of the base should be about one-half of that in the lower part. One important item must not be overlooked, longitudinal shearing strength of the inclined bars when they enter the base should be computed by the formula given under longitudinal shear. If the safe adhesive strength of the concrete and steel is exceeded, a mechanical bond should be provided. Also, the section H E should be thick enough to take the shear due to the horizontal pressure.

An improvement on this method of treatment is to design counterforts of sufficient strength to carry all the thrust due to the panel loads between them and to have thin slabs, of varying thickness with horizontal reinforcement, span the spaces between the counterforts.

A table is given for pressures and bending moments for computation of retaining walls.

ECONOMICAL DESIGN.—In regard to this subject, the writer has made a number of designs, mostly in bridgework, with a view to determining the limits in which certain types of construction should be used for greatest economy. A series of slab floors was designed with spans from 4 to 20′ by 1′ intervals, and from 22 to 30′ spans by 2′ increments designed for the same live loading, and also a series of arches with spans from 15 to 50′ by 5′ intervals. Assuming the cost of concrete in place at ₱20 per cu. yd. and the price of steel at 10 centavos per lb. in place, the following conclusions were drawn:—

The slab bridge (or floor) is economical for all spans up to 12′ clear. For a clear span greater than 12′ and up to 24′ the ribbed floor (T-beam type) proves most economical. The latter type for spans from 12 to 24′ will usually prove somewhat cheaper in first cost than the standard type steel stringer bridge in use by the Bureau of Public Works of the Philippine Islands at present. The costs assumed would not be strictly correct in actual practice on account of variations in the cost of forms, etc., for the different types, but they are a criterion to aid in chosing a suitable design for any given case.

For spans from 25′ and above, where it can be used, the arch is usually cheaper than the ribbed slab spans.

Reinforced concrete arches, when permanence is considered, are much cheaper in the long run than steel bridges, but sometimes they are not nearly so cheap as the latter. From estimates made covering spans from 30 to 50′ th: cost of reinforced concrete arches, with 14′ roadway, was found to be from ₱15 to ₱50 higher per ft. of span than steel superstructures for the same spans, the abutments being assumed to cost the same for either the arch or the steel superstructure.

REINFORCED CONCRETE CONSTRUCTION

[Reviewing methods of design and construction, Reinforced concrete, 10th Engineering District.—Limitations and modifications necessitated by Philippine conditions of material and labor.—Materials, formulas, tests, failures, derived methods, and empirical formulas based on ultimate strength of local materials.]

* The type of reinforced concrete bridge structure erected in this district has changed rapidly in recent years. The heavy arches originally constructed gave way in the last few years of the Spanish régime to steel spans. The first years of the American occupation introduced standard Howe trusses and short stringer bridges of good design and poor material (2nd Group of pine). Later the Supervisor's Office continued the use of the same types, but using good mate-

* Paper read by O. D. Filley, 10th Engineering District of the Philippines, at the Annual Assembly of District Engineers in Manila.

TABLE OF CALCULATIONS OF PRESSURES ON RETAINING WALLS

SLOPES VARIOUS—HEIGHTS VARIOUS—EARTH AT 90 LBS. PER CUBIC FOOT—FILLS LEVEL WITH TOP OF ABUTMENTS.

$$\text{Horizontal pressure} = P = \frac{(wx^2)}{2}\,\frac{(1 - \sin\Phi)}{1 + \sin\Phi}$$

x = height of fill above natural soil

$$P = 45\left(\frac{1 - \sin\Phi}{1 + \sin\Phi}\right)x^2$$

[This table to be used in special cases in designing retaining walls for 1 section.]

Slopes Φ	1 on 6	15°	1 on 2	30°	2 on 3	1 on 1
Angle Φ	9°28′	15°	26°34′	30°	33°42′	45°
$\frac{1-\sin\Phi}{1+\sin\Phi}$	0.718	0.588	0.382	0.333	0.286	0.172
P. for x = 5 ft.	808	653	429	375	320	194
6	1162	958	624	593	463	281
7	1583	1290	850	791	633	380
8	2168	1650	1100	952	825	495
9	2610	2150	1388	1210	1037	626
10	3230	2660	1728	1500	1282	778
11	3910	3220	2100	1825	1558	942
12	4650	3830	2510	2178	1860	1117
13	5450	4470	2930	2600	2180	1360
14	6330	5190	3325	2950	2630	1514
15	7270	5950	3870	3370	2890	1740
16	8110	6650	4400	3830	3280	1980
17	9330	7700	4980	4330	3700	2290
18	10450	8620	5600	4870	4160	2530
19	11650	9620	6260	5450	4650	2820
20	12920	10640	6950	6000	5160	3110
Bending Moments foot-lbs. for	The B. Ms. are taken about the foot of vertical wall					
x = 5	1340	1185	723	630	535	325
6	2324	1916	1248	1186	926	562
7	3693	3010	1973	1832	1465	878
8	5760	4390	2890	2540	2190	1315
9	7830	6450	4164	3630	3111	1878
10	10760	7170	5460	5000	4273	2593
11	14400	11840	7740	6740	5750	3450
12	18600	15320	10040	8712	7440	4468
13	23800	19600	12680	11250	9470	5940
14	29700	24400	15700	15750	12250	7140
15	36350	28750	19350	16850	14450	8700
16	43000	35400	23200	20600	17550	10550
17	52200	43400	28400	24800	21200	12950
18	62700	51400	33500	29300	25100	15060
19	74400	61000	39600	34600	29700	17750
20	86400	71200	46000	39800	34500	20700

rial (1st Group timber) and more recently have been introduced concrete designs embodying economies made possible by the practical application of the elastic theory.

The above first-mentioned type of bridge—the heavy arch of the Spaniards—was built of poor material (soft limestone). In removing these old structures, at the location of new bridges, this masonry has easily been handled with pick, bar or shovel. The design and execution of the foundations has been found to be uniformly bad,—in wasting material in their proportion and in a shallowness or lack of depth; a fault which has wrecked most of these structures. The ruins of 14 have been removed and replaced during the last few months.

The steel spans erected by the Spaniards are of French make—in one case on screw piles. These spans are still serviceable, but greatly weakened by rusting and by the burning of the floors during the insurrection. These steel spans were costly, light and short-lived.

The bridges erected during the American military occupation, although of good design, have gone the way of all timber bridges not of the 1st Group, preserved or roofed. The same type, using 1st Group, Molave, Ipil, or preserved timber, erected by the Supervisor's Office, will last from 5 to 10 years, with proper maintenance. These bridges, with abutments average ₱39 per running foot, and represent the best that can be done in this section in timber bridge construction.

Present Practice.—The radical change made possible in the design of curved and rectilineal arches by the application of the law of flexure, which allows the line of pressure to fall without the middle third and counteracts the resulting bending stresses with a definite reinforcing, permits the most graceful and permanent bridge-structure known; to compete, even in first cost, with the inexpressibly ugly truss, plate-girder and cantilever. The average cost of six arches between 25' and 50' over all is ₱37.38 per lineal foot.

Materials.—Gravel has been obtained from two sources, beach and river beds. The supply of beach gravel is practically unlimited, there being but few short stretches of beach where the sand is too poor in gravel to warrant screening. River gravel is obtained mixed with sand in about one-half the streams. Screening gives a gravel in appearance the same as beach gravel. The size is rather small, 9-10 passing through a 1" ring. The beach gravel is slightly the harder, wearing better on the roads than the river gravel, but tests of concrete blocks, 4" cubes, show no noticeable difference in the strength of concrete having these different gravels for matrix, though the average strength of this concrete falls somewhat below the strength of similar concrete assumed in the States' practice. The gravel is limestone and sandstone and apparently below the strength of standard gravel assumed by current tables, costing between ₱1 and ₱2 per cubic yard, delivered. Sand is of the same material, being the disintegrated gravel, and lacks in hardness, sharpness and size, and costs between ₱0.50 and ₱1 per cubic yard, delivered. No attempt is made to remove the salt from either the beach gravel or sand, and with no bad results further than the surface discoloration due to efflorescence. Fresh water is always obtainable.

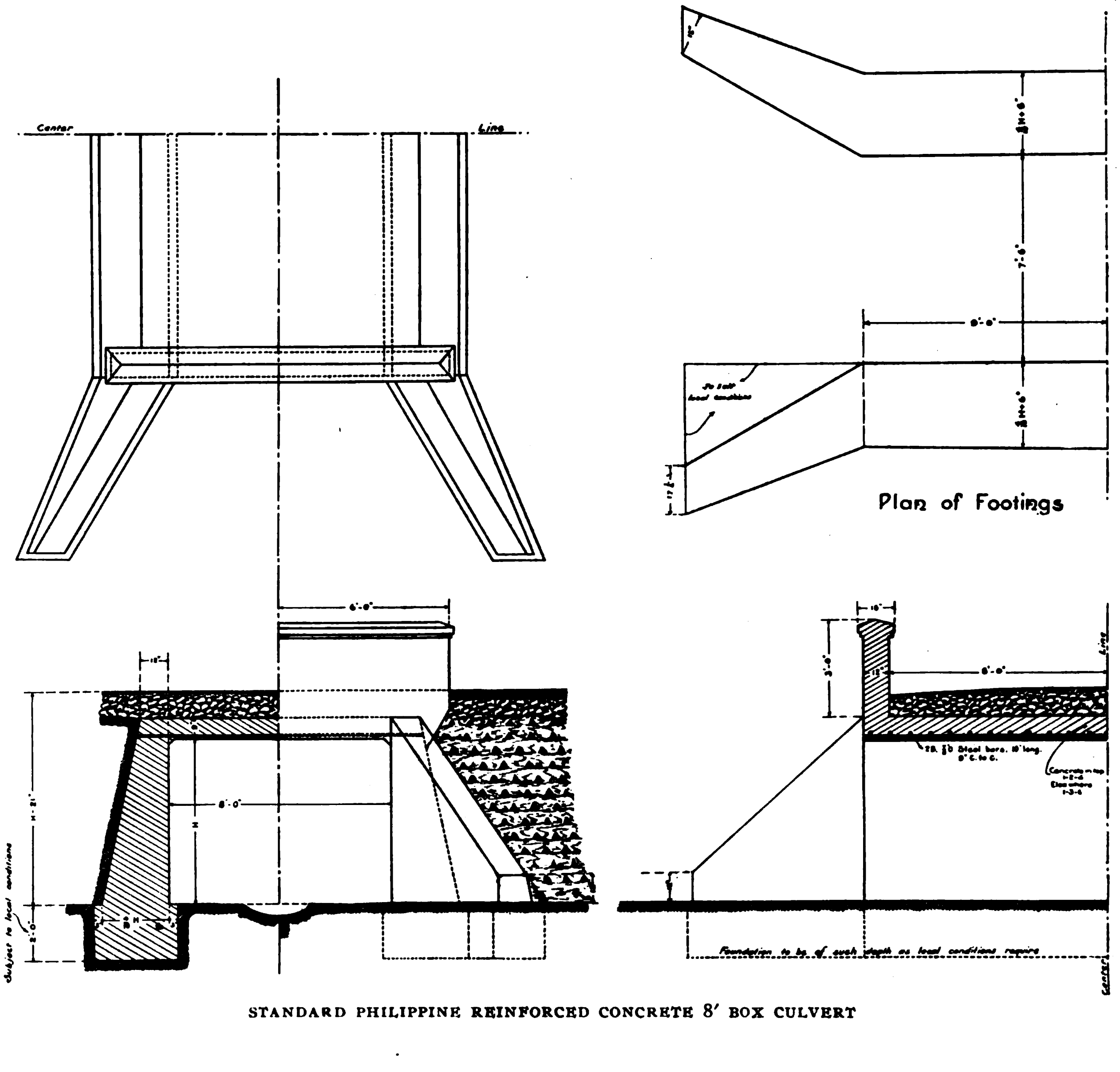
The cement used has been the *Green Island* Portland, Hongkong, which, since the detection of an occasional bad block of concrete, has been roughly tested when placed in arch-rings—each barrel being sampled. This cement has been obtained from local firms and from the Bureau of Supply, at ₱5.65, delivered in Iloilo.

Soft steel and wrought-iron have been used in sections of 1" and ½". These, as well as hard steel, have practically the same coefficient of elasticity (from 29,000,000 to 32,000,000), and under the same intensity of stress give the same amount of elongation or stretch regardless of the amount of carbon or of the grade of iron or of the elastic limit. These different grades are used interchangeably and are not given a load over 15,000 lbs. per square inch in any case—this assuming that for any grade of iron or steel the microscopic cracks and checks appear in the surrounding concrete at this stress and assuming that the limit of safety and usefulness is reached when these checks appear.

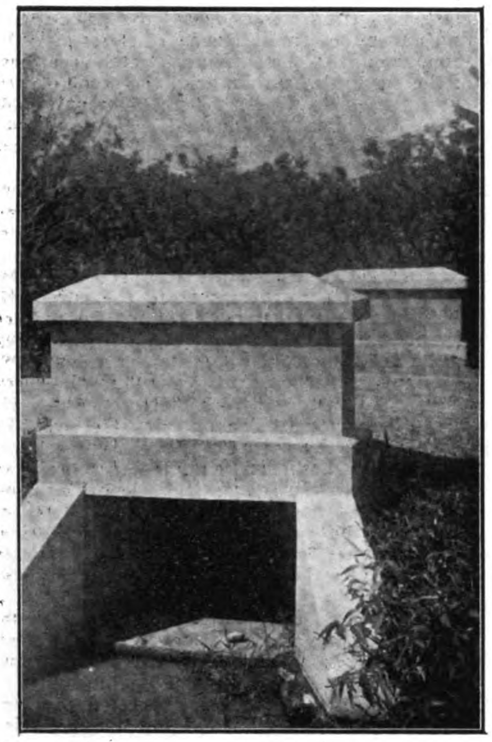
In respect to itself, hard steel gives a greater factor of safety. In respect to the composite beam, this extra strength cannot be utilized without wrecking the concrete, and, although for an equal moment of resistance, a beam will apparently absorb about twice the kinetic energy when reinforced by a high steel as when reinforced by wrought-iron or soft steel; yet the condition of the concrete about the reinforcement, which has been subjected to more than 15,000 lbs. to the square inch, is nothing more than cracked and permeable. Hard steel has no advantage over soft steel in reinforcing, and beams reinforced with any kind of reliable steel are given the same percentage of reinforcement, regardless of elastic limit.

No choice is given shape of section. Square bars give greater area of surface for equal volume, which is offset by the facility and completeness with which a round rod can be imbedded in the concrete. It has been suggested to place the square section diamond fashion or resting on one corner, but practically this requires more work than is warranted by the gain in facility of embedding.

Material for Forms.—Rough lumber, dressed umber, lumber lined with sheet-iron, and paper matting or Amacan on bamboo frame, empty cement barrels as centers for small culverts,



STANDARD PHILIPPINE REINFORCED CONCRETE 8' BOX CULVERT



STANDARD TYPE OF PHILIPPINE REINFORCED CONCRETE 3′ BOX CULVERT.

corrugated iron, machine-made collapsable steel forms for culvert pipes, and in reinforcing old timber bridges, the flooring in place, in steel bridges, the I-beams of the original structure are utilized as forms. Piling under foundation has been used from 6″ round to 18″ square, depending upon the conditions of load. The material has been considered unimportant, as piles are driven below water line.

Modified Formulas and Tables.—Foundations are run down to 4 or 6′, depending on material encountered and liability to wash. If at 6′ depth, good material for uniform bearing is not encountered, piling is resorted to. Bearing power, bottom of excavation: For safe loads for resistance on side of excavation for horizontal thrust of arches, take 8-10.

TABLE I.

Ordinary compressible wet sand of river bed	1½-2		tons sq. ft.
Alluvial soil—under spread footings	½-1		" " "
Gravel mixed with sand	4	6	" " "
Gravel and sand compacted, hardpan	8	10	" " "
Clay, soft in bed	1	2	" " "
Old Spanish masonry, poor	10		" " "
" " " , good	20		" " "
Native Limestone, beds soft	50		" " "
" " " hard	100		" " "

The hardened and compacted condition of the old road approaches can usually be utilized in providing the necessary resistance to the horizontal thrusts. Whether the main base of the foundation is horizontal, vertical or partly both horizontal and vertical, as is usually the case, or is inclined normal to the resultant of pressure, the resultant of pressure must fall well within and be properly distributed over these areas. Strength of resistance of unit sections of vertical face of excavations being taken as 8-10, the strength of the same material in horizontal plane or base.

Piles.—Assuming the pile is cut off below water line and that no brooming remains:—

Where L = Destructive load,
L′ = Safe load,
W = Weight of hammer, pounds,
D = Drop of hammer, last blow, in feet,
S = Set of pile under last blow, in inches:—

$$\text{then } L = \sqrt[3]{\frac{D \times W \times 0.23}{S + 1.0}}$$

Safe load L′ = ½ L to ⅙ L: take ½ L for firm material, and ⅙ L for river mud or marsh.

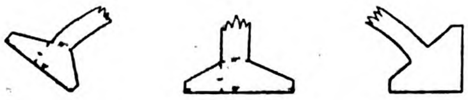
In estimating reloading old piles in good condition, well driven, when test loading cannot be effected:—

5—10 tons load below water line,
1—8 tons head of pile above ground, depending upon condition of pile and its bracing.

Posts, braces, short or well-braced false work: Apitong and 2nd group:—

TABLE II:

Diameter, inches.	Area.	Safeload, total tons.
1	0.8	0.3
2	3.1	1.3
3	7.1	2.9
4	12.6	5.2
5	19.6	8.2
6	28.3	12.
7	38.5	16.
8	50.3	21.
9	63.6	26.
10	78.5	32.
11	95.0	39.
12	113.1	47.
13	132.7	55.
14	153.9	64.
15	176.7	73.
16	201.1	84.
17	227.0	94.
18	254.5	106.



Spread footing in any position.
T = Thickness footing.
W = Width footing base.
W′ = Width footing top, superimposed masonry.
C = Distance C to C of bars.

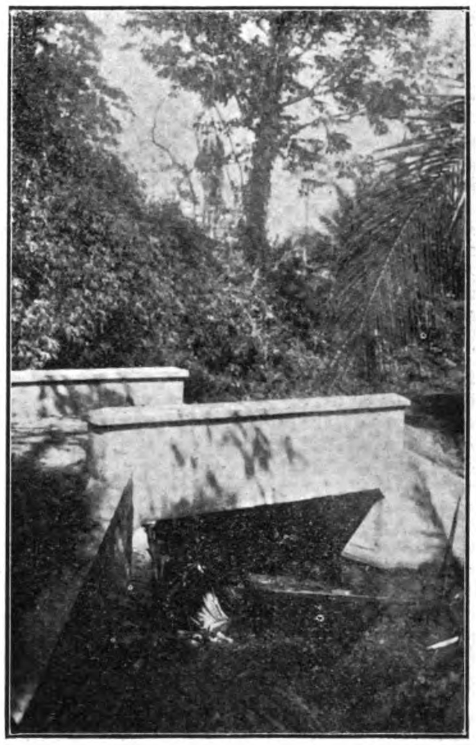
Assuming inch-square bars, tension 15,000 lbs. sq. in., 1:2:4 gravel concrete. Panay. Local conditions of labor and material. Table of dimensions of footing for 60-tons safe load, per lineal foot, perpendicular to reinforcing bars:—

TABLE III.

W	T	W′	C
18′	3′6″	6′10″	3″
17′	3′3″	5′6″	3″
16′	2′10″	5′0″	3″
14′	2′8″	4′8″	3″
12′	2′6″	4′4″	3″
10′	2′3″	4′0″	4″
8′	2′0″	4′0″	6″
6′	1′8″	3′6″	10″

or generally Mo = 0.85 d ST. (Sewall.)
Mo = Moment of resistance of cross sections.

REINFORCED CONCRETE OFFICE AND STORE-ROOM OF THE SURVEYOR OF THE PORT, AT ILOILO; COST ₱4,110



STANDARD TYPE OF PHILIPPINE REINFORCED CONCRETE 14′ CULVERT

d = Effective depth, *i. e.* depth to center of steel.
S = Area steel reinforcement.
T = Tensile stress per sq. in. metal.

Assuming balanced arch-thrusts, central piers are given a thickness of 1-12 clear span without reinforcing.

Abutments.—The abutments must be massive and designed to resist the overturning moments. This is usually easily effected with a proper adjustment of spread footings. The elastic theory is based on the assumption that the abutments are rigid and the large moment of inertia of massive design, large in comparison with the section of the arch ring is necessary, assuming elastic yielding of the abutments.

At the intersection of the abutment and arch ring, the angle between the resultant of the forces of the arch ring and the perpendicular to the bed of any layer of concrete should be maintained less than the angle of repose or 20°—30°.

Abutments for flat arches and their wing walls may be designed as simple retaining walls by b = 4/10 h which gives ample section for the vertical load of ½ weight of bridge.

High wing walls, spandrel walls and retaining walls:—

$$Py = \frac{wx^2}{2} \cos \theta \times \frac{\cos \theta - \sqrt{\cos^2\theta - \cos^2\phi}}{\cos \theta + \sqrt{\cos^2\theta - \cos^2\phi}}$$

Where Py = Resultant pressure.
W = Weight Unit volume backing.
X = Height of wall to top of fill.
ϕ = Angle of repose of backing fill.
θ = Angle of finished grade backing fill.

For level fill as is usually the case, $\cos\theta = 1$.

$$Py = \frac{wx^2}{2} \times \frac{1 - \sqrt{1 - \cos^2 \phi}}{1 + \sqrt{1 - \cos^2 \phi}} = \frac{wx^2}{2} \times \frac{1 - \sin \phi}{1 + \sin \phi}$$

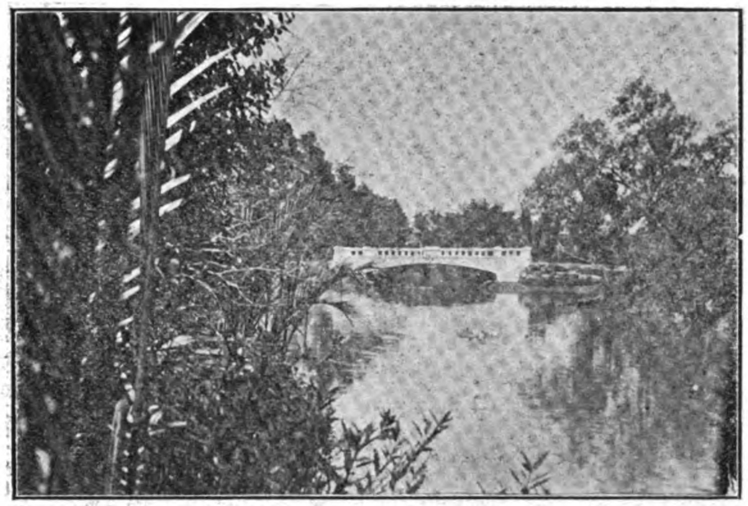
Dry fill

With $\phi = 1\frac{1}{2}$ to 1, slope $\phi = 33° \; 41'$ sin = 0.555 and $Py = wx^2 \; 0.14$

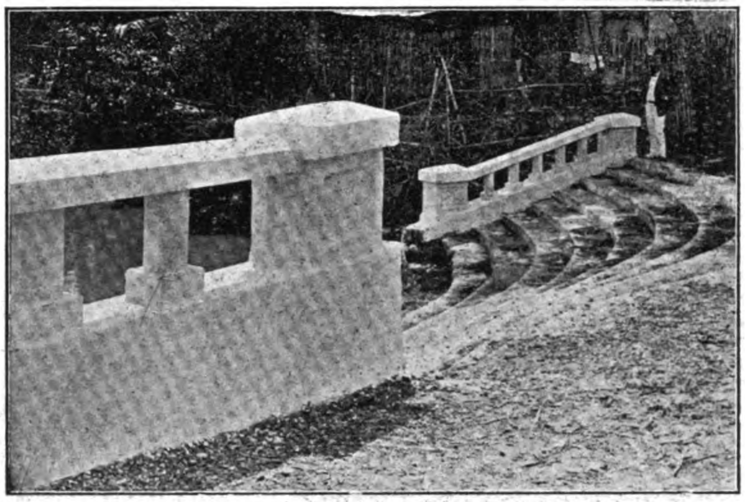
In most cases, the backing is liable to become in part or wholly saturated with water during the rainy season through defective weep holes or drainage, and as the fill is usually made wet for compacting and to evade future settlement,

$\phi = O$ and $Py = \frac{wx2}{2}$ (a hydrostatic form).

Py acts at $\frac{x}{3}$ above base giving moment. Mo =



REINFORCED CONCRETE BRIDGE AT OTON, ILOILO PROVINCE; LENGTH OVER ALL, 50′; WIDTH, 16′; SPAN, 36′; COST, ₱1,374.21



RETAINING WALL AND WATERWAY STAIRWAY CONSTRUCTED OF REINFORCED CONCRETE IN ILOILO PROVINCE

$$\frac{PyX}{3} - \frac{wx^3}{6}$$

but Mo = 0.85 d ST

$$S = \frac{Mo}{0.85\ ST} = \frac{wx^3}{5.10\ dT}$$ Giving area steel for assumed effective width of wall. (d = meas. face to steel)

or

$$d = \frac{Mo}{0.85\ ST} = \frac{wx^3}{5.10\ ST}$$ Giving effective width of wall for assumed area of steel. (d = face to steel).

The wet fill, as usually made, consists of surplus material from the excavation—sand, gravel and loam— which, when wet and rammed in layers back of arch and abutments, weights 120 lbs. per cubic foot = steel—T = 15,000.

or Mo = 20 × ^{3}

$$S = \frac{.000158X^3}{d}$$

$$d = \frac{.000158X^3}{S}$$

Table of reinforcement and spacings, retaining walls on rigid bases as wing walls on spread footings, spandrel walls on arch ring, etc., assuming reinforcement locked into base:—

TABLE IV.

[12″ walls at base.]

Height "X"	Sq. in. metal for running-foot wall	Spacing C to C ½″ bars
4	0.019	13′
5	0.035	7′
6	.061	4′
7	.096	2′6
8	.143	1′7
9	.204	1′2
10	.280	0.9
11	.373	0.7
12	.484	0.5

[18″ wall at base.]

Height "X"	Sq. in. metal for running-foot wall	Spacing C to C 1″ sq. bars.
13	.615	3′2
14	.777	2′6
15	.945	2′0
16	1.147	1′6
17	1.376	1′4
18	1.633	1′2
19	1.921	1′0
20	2.240	0.8

Three points—crown point of *intrados* and two springing points of the same curve—are assumed in the following methods to be predetermined by the survey of the site. These points are determined as follows:—

Where

Q = Number of cubic feet per acre per second flow off through the bridge.

C = Coefficient varying from 31 to 75, depending upon the nature of the surface, 50 is assumed for prevailing condition in Panay Coast lands.

R = Average intensity of rainfall in cubic feet per acre per second, obtained from Weather Bureau monthly bulletin.

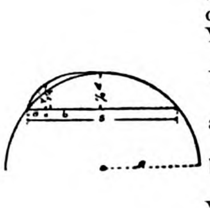
S = Area drained, in acres.

$$Q = \sqrt[4]{\frac{S}{A}} \quad \text{(Hering)}$$

From the quantity of flowoff "Q," the profile of survey of site and the probable form of arch, the three required points are determinate, and are located on the profile. This assumed area of waterway is then checked by observing flood line on other bridge openings or restricted parts of stream and by taking the evidence of native inhabitants of repute, as to exceptional floods.

First Method.—Arch curves of Extrados and Intrados:—crown thickness—When earth loading is considered the curve of *intrados* is designed by passing the segment of a circle and the curve a semi-ellipse through three points in common—the crown point of the *intrados* and the two springing points of the same curve, and then bisecting the vertical ordinates between those two curves for the new intrados. This method has now been applied in several hundred concrete arches of spans up to 100′, all of which have proved so universally free from bending moments under earth loading that it may be accepted without further analysis of stresses. (Luten, *Engr. News*, LV. 13, 348).

Ordinates to intrados curve:—



S = Major axis ellipse.
d = Minor axis ellipse.
Y = Ordinate to point on ellipse.
Y′ = Ordinate to same point on ellipse.
a = Abscissa same from one vertex ellipse.
b = Abscissa from other vertex ellipse.
Y″ = Required mean ordinate $= \frac{Y' + Y'}{2}$

Given a, b, R, and S:—

$$Y = \frac{d}{d}\sqrt{ab} \quad Y' = \sqrt{R^2 - (\tfrac{1}{2}S - a)^2} + \tfrac{1}{2}\, d - R$$

$$\left(\text{apprx } Y' = \frac{ab}{2R}\right.$$

$$Y'' = \frac{\frac{d}{D}\sqrt{ab} + \sqrt{R^2 - \left(\frac{S}{2-a} - o\right)^2}\frac{d}{x2} - R}{2}$$

$$\text{or } \left(Y'' = \frac{\frac{d}{D}\sqrt{ab} + \frac{ab}{2R}\text{apprx.}\right)}{2}$$

The curve of *extrados* is then determined by the crown thickness and 1¼ to 1½ crown thickness at the quarter points.

Crown Thickness.—This determination is necessarily indirect, the dimensions being a function of the weight of the arch, which weight in turn is a function of this dimension.

An approximate thickness is obtained from an expression combining the experience of past construction with theoretical requirements from which dimension is obtained the probable weights, the horizontal thrust and a graphic stress diagram.

The following expression varies as the bending moment and conforms with the principle that the moments very directly as the rise and gives a value for T which, although closely approximating recent successful examples of the States' practice, makes due allowance for the slight observed deficiency described in the concrete now being used:—

T = 0.08 R + 0.008 S.

Where T = Thickness of crown,
R = Rise.
S = Span.

Which gives the crown point of the curve of extrados. Two other points are determined by making the arch thickness at the quarter points 1¼ to 1½ crown thickness, a segmental arc through these points giving the required *extrados*.

The *intrados*, *extrados* and grade line of spandrel fill determines the dead load L from which is obtained the horizontal thrust H by

$$H = \frac{L\,S}{8\,R} \qquad \text{Where } S = \text{Span}, \; R = \text{Rise}$$

The stress diagram and line of pressure are then determinate by graphics.

Dead Load.—From the stress diagram may be obtained the thrust amount and direction on each assumed voissure in any section of the arch ring, from which is deduced the arch thickness to resist direct thrust of dead load.

Live Load.—Maximum load is assured as acting upon the critical point 3/16 = span (Von Emperger) from center, moment of rupture Mo at point C is obtained directly by graphics:—

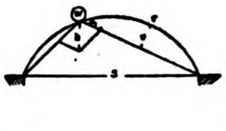
Mo = mn

and where Mo = d S T

$$S = \frac{mo}{d\,T}$$

or

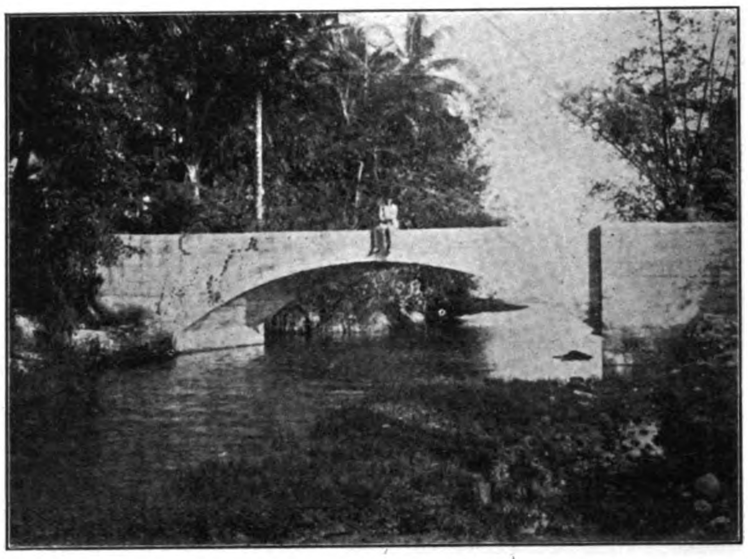
$$S = \frac{m\,n}{d\,T}$$



where d = distance between centers of two opposed systems of reinforcing.

Which amount of steel S may be carried uniformly throughout the arch ring from abutment to abutment or varied proportional to Mo at different sections, retaining not less than 1 sq. in. metal to each sq. ft. in cross section. An equal amount S is placed at both extrados and intrados line, considering each system of rods as alternately a stiffened set of tension members and at a point opposite on the arch ring as a stiffened set of compression members no extra section of concrete is apportioned for the compressive resultant of bending moment.

STANDARD TYPE OF PHILIPPINE PROVINCIAL REINFORCED CONCRETE BRIDGE



PHILIPPINE PROVINCIAL REINFORCED CONCRETE BRIDGE; COST, ₱37.38 PER RUNNING FOOT IN PLACE

Mr. Cain gives good reason for "The radical depth of the reinforced concrete arch ring must not be made greater than is necessary for the maximum unit stress on the concrete to remain within certain safe limits." (Trans. Am. Soc. Vol XXXI—6—483.)

The advantages of this method are (*a*) the simplicity of the solution by graphics giving directly working dimensions and the fact (*b*) that there are no recorded failures where its provisions have been complied with.

The objections are (*a*) the empirical approximation only of the location of the line of intrados even though a second mean be taken between the derived intrados and the circular segment or the semi-ellipse: the attempt to fit a geometric curve to a curve which is theoretically and practically not geometric can only result in an approximation.

Second Method.—Application of the Law of Flexure in Solid Arches.—A refinement of the preceding method permits of an accuracy in the location and calculation of stress in the compression and tension members in respect to any possible location of the line of pressure sufficient to class the design of the arch among the determinate problems of structures.

From the data derived in the preceding approximate method corrected weights may be calculated, and a new stress diagram made. The final curves of intrados and extrados are located by taking equal depth of areas on either side of the line of pressure required by the direct pressure and bending moments derived from the stress diagram for live and dead loads as follows:—

Dead Loads.—The stress diagram gives the direct pressure normal to any section of arch ring, pressure due to dead load and for this compressive stress a depth of ring is calculated depending upon the strength of the concrete in use.

The line of pressure falling in the geometric center of this design, the arch is evidently safe for the dead load assumed. The bending moments introduced by the proposed live load are then taken entirely by the steel reinforcement.

Live Load—Assuming a maximum live load, its corresponding line of pressure is plotted and its intercept on an ordinate from the neutral axis or original line of pressure multiplied by the new pressure gives the bending moment in this section. The amount of the intensity of tensile stress to be taken up by the proposed steel reinforcement and the intensity of the compressive stress corresponding to be taken up by the equal area of steel at opposite surface of arch ring is obtained from:—

$$Mo = T\ i$$

$$S = \frac{T\ i}{d\ T}$$

Where T = Amount of deflected thrust on section of arch ring.

i = Intercept of ordinate between neutral axis and deflected line of pressure.

Mo = Bending moment on section.

Otherwise:—

Assuming as before, the tension resultant of the bending moment carried by the steel but the compressive resultant taken by the concrete in arch ring—by law of flexure in solid arches.

Assuming steel symetrically placed about neutral axis:—

$$fs = \frac{e\ T}{Ac + ea} = \frac{6\ eh'\ M}{Ic + eIs}$$

Where fs = Intensity of stress in steel.

$e = \frac{E\ s}{E\ c} = 20$ (Thacher)

T = Thrust on section 1″ wide, pounds.

Ac = Area of section of concrete 1″ wide

a = Area of steel per inch width b, $= \frac{As}{b}$

h′ = Depth of steel in inches.

M = Bending moment section 1″ wide, foot pounds = T t.

Ic = Moment inertia concrete Ac about neutral axis of combination.

Is = Moment inertia steel about neutral axis of combination.

Compressive strength of opposite system of reinforcing is ignored and voissure depths are increased by amount proportional to fc.

Shear and Cross Reinforcing.—Are not susceptible to algebraic expression. The best results are obtained by (*a*) shear reinforcing across the arch-ring at points bisecting and trisecting the half-ring in quantities varying as the span rise. Varying between nothing for semi-circular arches and 1.4% for a flat arch approaching beam construction and (*b*) cross reinforcing, transverse reinforcing of .04% of longitudinal section of arch ring.

Lapover of Steel.—The amount of lapover in rods to obtain the efficiency of the continuous bar assumed and the length that a bar must be anchored in concrete in order to withstand the pull of the bar in tension. Assuming inch-square bars under 15,000 lbs. tension and safe working adhesion under local conditions of 80 lbs. square inch of surface:—

Required length $L \times 4 \times 80 = 15{,}000$

$$L = 47''$$

Lapovers are therefore specified at 4′.

Reinforcing; Disposition of the Metal.—Transverse bars of small diameter must be used in slabs. For deep girders requiring large quantities of steel, it is better to use small units in two or more rows, if necessary, than to concentrate the metal. For arches subject to both the compressive and bending stresses, the requirements appear to be different, for instance, the Austrian tests on arches gave much higher results for systems of heavy concentrations spaced 39″ C to C than for systems of rods spaced but a few inches apart.

Flat Arches, Slabs, Beams and Ribbed Slabs.—Flat arches and slabs are considered as a series of beams side by side with transverse reinforcement of 0.35%.

Beams:—

Where W = breaking load pounds uniformly distributed.

D = depth beams to center of reinforcement, inches.

L = clear span in feet.

b = breadth of beam.

With reinforcement at 1.4%

$$D = \sqrt{\frac{W\ L}{293\ b}}$$

This assmes that the local concrete 1:2:4 is equivalent in strength to 1:7 gravel concrete of Kidder's test.

Otherwise:—

Local conditions of

fs = 15,000 fc′ = 400

and 1 = Span

a = Area steel in tension per unit of width.

$$v = \frac{q}{1.5333}$$

$$x = q - v$$

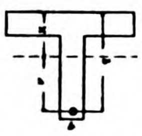
$$a = \frac{q}{144.38}$$

$$W = \frac{1666}{1}\left(\frac{x^3}{20\ v} + 3\ av\right)$$

Continuous Beams; Cantilever. That arches, slabs and beams built continuous over abutments with the upper reinforcing extending minimum distance of ¼ L both sides of abutment or equivalently anchored:—

$$D = \sqrt{\frac{0.8\ W\ L}{293\ b}}$$

Ribbed Slabs.—The rib and section of floor adjacent forms T-beam section.



The resistance of shear at plane of intersection of rib with floor is provided by the transverse reinforcement of floor and by increasing b of rib as it approaches intersection. The width of floor acting in compression as upper flange is limited by the strength of the smallest section of intersection of the beam and the slab, b being usually greater than t, the least section in greatest shear stress is that section of the slab falling in the v vertical planes of the faces of the beam.

Shearing strength, safe. $S = \frac{f}{2 \tan \theta} = \frac{400}{3.464}$

= Apprx. 100 lbs. sq. inch.

The shearing strength on one side of the beam $= 100 \times \frac{1}{2}\,tL$

The opposed strength of slab in compression $= 400t \times$ width of slab on one side of beam. Equating.

$100 \times \frac{1}{2}t \times L = 400t \times$ width of slab.

or Width of slab one side $= \frac{L}{8}$

The slab may therefore be assumed as acting as an upper flange to half distance to the adjacent parallel beam where this distance is equal to or less than $\frac{L}{8}$

The rib is designed as a beam carrying full load. The reinforcement of beam is then increased to 1.4% of area of concrete A + A′. Where A = area of concrete in beam and A′ area probably acting as flange, W is made w $\frac{A}{A+A'}$ and d recomputed. This assumes the value of the moment of resistance of the elements of the added slab area vary as the moment of the vertical elements of the beam, or T-beams.

Earthquake Provisions.—Engineering News editorially proposes "earthquake construction" for structures in earthquake zones, suggesting that structures be built in such a way that they can resist the vibratory impulses of shocks to a certain degree:—"The experience had with thousands of structures in the California earthquake affords the certainty that in the matter of building it is not impossible or even difficult to accomplish this. It seems probable that bridges may, with little trouble, be rendered fairly resistant."—The manner not difficult is, unfortunately, left undescribed. Analysis of possible stress produced by this cause appears impracticable. However, a provision may be supplied by an application of the fact that it is possible to assume such a combination of strains set up in the arch ring by earthquakes to produce their resulting maximum stress at any point in the arch ring; from which it appears that no part of the arch ring should be found weaker than another.

The variable amount of reinforcement provided by the preceding methods might be supplanted by a system of reinforcement of uniform strength throughout the length of ring and equal in section to the section required by the maximum bending moment of the live load.

False work—For spans up to 30′, which includes the large majority of cases, the simple wooden curve rib without timber counterbracing is used in four lines for width of forms up to 16′. The small forces of possible derangement are taken care of by light bracing of such convenient material as bamboo, planks or scantlings.

The curved ribs for spans over 30′ are supported by posts and diagonal bracing proportioned by Table II.

The straight ribs or beams for flat arches and slabs:—

Deflection $D = \frac{5\,W\,l^3}{384\,EI}$

Where W = Weight of pounds uniformly distributed.

l = Length of span, C to C of supports in inches.

E = Coefficient or modulus of elasticity of the timber.

E = 1,200,000 Apitong, Lauan.
1,600,000 Molave, Ipil.

I = Moment of inertia of cross section in inches.

Beams, single load middle:—

L = Safe load pounds $= \frac{b\,d^2\,A}{S}$ or $b = \frac{S\,L}{d^2 A}$

A from table.

L = Safe distributed load $= \frac{2bd^2\,A}{S}$ or $b = \frac{S\,L}{2d^2 A}$

Beam, concentrated load not at center:—

$L = \frac{b^2\,d\,S\,A}{4\,m\,n}$ $\quad ab = \frac{4\,L\,m\,n}{d^2\,A}$

m and n distances of load from points of support.

Beam loaded two points m distance from each end:—

Each load $L = \frac{b\,d^2\,A}{4\,m}$ or $b = \frac{4\,L\,m\,n}{d^2\,A}$

Values of A, coefficient for beams:—

Apitong	60	steel	888
Lauan	50	wrought-iron	666
Ipil, Molave / Dungan, Guilo	100	cast-iron	308
		concrete	10
Redwood / White pine	60	limestone	14
Yellow pine	100		
Oak	75		

Constants; steel:—

Soft, 0.15% carbon, ultimate tensile strength 60,000

Elastic limit 36,000

Modulus of elasticity Es 29,000,000 lbs. per sq. in.

Elongation 1 part in 14,500, 1 ton per sq. in.

Working stress 15,000 lbs. sq. in.

Concrete (local) compressive strength:—

Ultimate compressive strength 1:2:4 7800 lbs. sq. in.

Ultimate compressive strength 1:3:6 4200 sq. in.

Safe $\frac{7800}{20} = 390$ take 400 lbs. sq. in.

$Ec = 2,400,000$

Tensile strength:—

Safe load $\frac{400}{10} = 40$ lbs. per sq. in.

Shearing Strength:—

Safe load $S = \frac{fc}{2\tan\theta} = \frac{400}{3.464} =$ apprx. 100 lbs. sq. in.

Weight 1 cu. ft. = 135 lbs.

Tests and Derived Methods.—Systematic tests have been recently undertaken. Machine used: Steven's (Glasgow) hydraulic press, gauge reading to 1200 tons; Taller Visayas, Iloilo. Concrete cast in brass forms forming 4″ cubes, mixtures No. 1 and No. 2, age from 1 to 25 days.

Data derived was plotted graphically and the resulting curve until confirmed by future tests was prolonged by Trautwine's ratio to 6 months; ultimate strength is assumed to be double the strength at 6 months (Buel and Hill). The safe working stresses are obtained by dividing these ultimate strengths by the required factors of safety.

To test the practical limits of the assumed constants, derived from the small tests, it was decided to overload one of three spans under construction. Overloading may be accomplished by either increasing the load without changing the strength of arch ring, or by decreasing the strength of arch ring without changing the loading. The latter method was adopted and falsework and centers were slacked away from a 32′ span, 5′ rise, in 24 hours after placing the concrete. With the assumed constants, the 1:3:6 concrete of this ring had a breaking strength of 26 lbs. per square inch. The ring weighed 76,169 lbs., with a thrust in ring of 60,800 lbs. or 26 lbs. per square inch. The arch showed no signs of distress; a normal settlement of ⅜″. Assuming the arch about to fail, the factor of safety of at least 20 was in evidence.

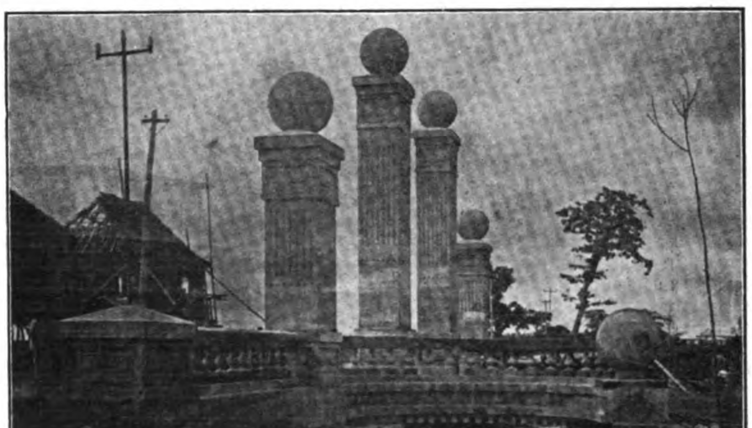
Assuming undue deflection as failure, a 36′ span, 3′ rise, was loaded to failure; mixture was taken 1:3:6. The arch was partly loaded with wet spandrel fill and centers removed at 7 days giving 140 lbs. thrust in arch ring, the calculated ultimate strength being 125 pounds. No vertical reinforcing between spandrel walls and arch ring. Arch and spandrels settled ⅞″ during first day, ⅜″ second day, arch ring separating from spandrel wall on one face, from spring line to 3′ beyond crown, spandrel wall on opposite side cracking vertically over spring line from coping to within 1′ of arch ring, crossing the horizontal reinforcing of 1 inch round steel.

Settlement ceasing, the arch was made stable by the reduction of the span to 34′ by filling in an offset in the foundations and by the conjugate pressure of the spandrel fill rolled down with a steam roller.

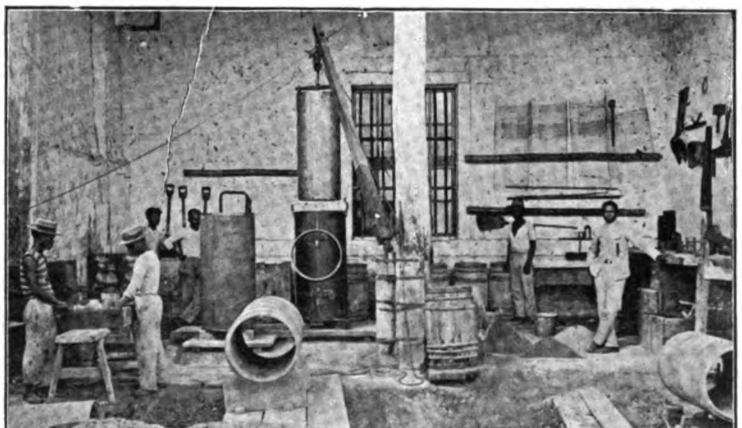
It would appear, in this case, (*a*) that the actual ultimate strength was not more than 140 lbs. or not more than 12% over the calculated stress; (*b*) that spandrel walls are self-supporting, and their weight should not be included in assumed load where artificial joints are not placed over spring lines; (*c*) that where settlement is expected, for reasons of light construction, yielding foundations or long span, that artificial vertical "expansion joints" should be left over the spring lines; (*d*) that the vertical reinforcing of the spandrel walls should be locked into the arch ring; (*e*) and that the wrecking of a reinforced arch by overloading is a slow process, with ample warning.

A flat arch, 9′ span, slab 6″ thick, 1:2:4, was tested after seven days, with concentrated center load of 3-ton roller, gave no measurable deflection. This is approximately equivalent to 12-ton center load (including weight of slab) at one end of each month, by form, ultimate strength W = 15 tons, center concentrated load.

Forms have been made for tests of T-beams, fish-belly and open truss construction in the attempt to procure a long span design without the objection of the horizontal thrust of the elastic arch, by which the adaptability of reinforced concrete construction would be extended



REINFORCED CONCRETE ENTRANCE GATEWAY AND CULVERT, SCHOOL OF ARTS AND TRADES, ILOILO



MAKING LIGHT REINFORCED CONCRETE CULVERT PIPES FOR THE PHILIPPINE GOVERNMENT; COST ₱3.20 EACH

to any location where the light spread footing may be constructed. The satisfactory fish-belly type leads the way to a form of open truss construction of some promise.

Methods.—The necessity of the bridge being determined, the survey of site indicates the type and size of structure. Arch ribs falsework are marked out full size on the work. Bridge reinforcing is effected over tops of piles when material between piles is compressible. Concrete is made to a "wet" mixture although the ratio of 12 to 11 is in favor of the dry concrete, the ease of depositing and the good contact with reinforcing obtained make the wet mixture preferable. Vertical reinforcing for the wing walls and high abutments, and first reinforcement for arch ring are bedded in the sub-foundation and aligned. Concrete work on arch ring is continued without stop until finished (a small night gang keeping the concrete line fresh), placing vertical reinforcing for spandrel walls. In arches under 30′ span, falsework has been removed in all cases within two weeks, without damage. Curved, in place of angular, wing walls add practically nothing to the cost and present a better appearance. The same may be said of the open balustrade. All walls or surfaces locking in or tending to retain water, as at springing points of arches, must be drained by proper openings.

In arches over 30′ span, the centers should be left in from 30 to 60 days and the wet spandrel fill should be made before removing centers.

CEMENT IN FAVOR IN INDIA

A great deal of cement is used in India in building operations. Portland cement is considered the best and is used for all particular work. It is used in laying brick walls in foundations, and wherever wood is used for structural purposes it is laid in cement whenever possible. Floors, moldings, cornices, and outside and inside trimmings are made of sand and cement. Wherever cement can be used to guard against vermin, especially white ants, it is freely used. Houses that have flat roofs are covered with brick dust and particles of brick mixed with cement and stamped down hard. Pitched roofs are covered with corrugated iron or tile and then solidly covered with cement and sand. These roofs last well and require little repair. Artificial stone is extensively manufactured and used in India for building purposes and for pavements and walks. Floors are laid in cement and made ornamental by embedding broken glass and china in figures in the body of the cement. The outsides of temples are made in the same way and are very attractive. Thus cement is in general use and always will be in India. The imports of cement as long ago as 1870 were valued at $50,342 gold, advancing in the fiscal year 1900 to 729,478 hundredweight, valued at $500,332, and in 1906 to 1,778,428 hundredweight, valued at $1,070,275. The imports of cement for the first four months of the present calendar year were 574,006 hundredweight, valued at $333,427. The supplies of cement for India come mainly from the United States, the United Kingdom, Belgium, and Germany. Inferior cement is not wanted, but the best cement is in good demand at good prices.

ENGINEERING COMPANY'S PROGRESS IN NORTH CHINA

Regarding the affairs of the Chinese Engineering and Mining Company, Ltd., at Chingwangtao, which seem to be progressing most favorably, there is, in addition to the completion of the extension of the breakwater to 2,300′ and the work of replacing the jarrah piles of the pier by iron joists, which is now completed, the construction of a second chord quay in progress and a new berth of 300′ long has been constructed for the use of the steamer *Kaiping*. In speaking of Chingwangtao at the annual meeting, the chairman of the directory said:—

"The depth of water alongside this new berth is 19′ at low water of ordinary winter and spring tides. The stone buildings, each 100′ long by 45′ wide, have been constructed to provide quarters for 600 coolies. A brick godown, 600′ long by 45′ wide, was also constructed for storing cargo for steamers, besides smaller godowns. It may be mentioned, as indicating the increasing importance of the port, that several influential firms have already established themselves there, and a village of 2,000 inhabitants has sprung up within the last two years to the north of our coal yard, close to the boundary of the company's land. We are advised that the facility with which steamers can now be loaded and discharged at our breakwater and pier will bear comparison with any port in the Far East, and is superior to most. Last winter was one of unusual difficulty for steamers coming to the port, owing to the exceptional severity of the frost and the absence of the wind required to break up the ice; but although the ice extended for a considerable distance from the pier, it was never sufficient to prevent the ships from getting through. Our general manager writes that he looks upon the prospects of Chingwangtao as very satisfactory, and is confident that within a very short time further considerable development in the value of the port, as well as in the trade of the port, will be seen. We told you at the last meeting that the important question before us was the increase of our output, and that was mainly a question of dealing with the water in the Tongshan and Linsi mines. From the commencement of our company it has been recognized that a large part of the mechanical installations of the collieries left much to be desired on the score of efficiency. One consequence of this has been an excessive consumption of fuel at the mines. Our pumping appliances, particularly, have been a source of trouble, requiring as they have done, frequent repair; and, while they have hitherto served our purpose, they are quite inadequate to the task which will be imposed on them in view of the large increase which we propose to make in the output, and the necessity of guarding against the possibility of an inundation of any portion of the mines. Reserves of coal are known to exist in the Tongshan mine, which hitherto could not be worked for fear of causing a flow of water with which our pumping installation would not be able to cope. The installations for lighting and ventilation are also defective and insufficient for our contemplated scale of operations. In order to deal with all these matters, after prolonged investigation, we adopted a scheme for the construction of electrical stations at each of the mines of Tongshan and Linsi, these stations to furnish the power necessary for the pumping and the various other underground and surface installations on such a scale as to provide for the increase in the near future of the present production of about 3,000 tons per day up to 5,000 tons per day or more. In the months of November and January last, contracts were entered into for the necessary plant, which has been in course of erection for some time past. The buildings for the power stations are nearly completed. The contracts require that the pumping plant at Tongshan shall be in operation by November 8th, 1906, and that at Linsi a month later. The remainder of the accessory installations are to be completed in February next. The power-station at Tongshan will be capable of developing 3,200 h. p. and that at Linsi 4,800 h. p. The pumps are calculated to deal with all the water that may be expected after the full extension of the scale of our operations, and to leave an ample margin. The electrical stations will also be able to supply, later on, the necessary power for electrical traction in the interior of the mines, and thus enable us to replace the present mule transport, which is defective and costly. They will also provide power for the winches for the inclined planes, the secondary pumps; in a word, for the whole of the installations underground and at the surface. At present everything points to the contractors completing the works within the specified time. In order to obtain the increase of production, of which I have just spoken, it is necessary to enlarge, to deepen, and to reequip a pit at present existing at Linsi. At this shaft we have decided to establish mechanical screening, so as to permit of the coal being cleaned and classified, and thus provide for the various demands of the market. The amount of capital expenditure involved in the works which I have referred to will, of course, be very large; but we are glad to say that our financial condition is such that we are in position to meet all requirements. Now as regards the results of the current year, so far as we have gone they are eminently satisfactory. There has been an increase in the output of about 90,000 tons and an increase in the proceeds of the sales of about $300,000. All our information tends to show that we may expect a continuance of this state of things during the remainder of the year and a corresponding increase of profit. In conclusion, I think we may safely say that our enterprise is to-day in a stronger and healthier condition than it has ever been. As you have already heard, there is now a much larger demand for our coal than we have hitherto been able to meet. The works which we have undertaken, and which are now nearing completion, will not only place us in a position to meet this demand, but should also enable us to diminish to some extent the cost of production, and with these facts before us we are justified in looking forward to a steady expansion in the profits of the company, and, consequently, in due time, to an increase in the dividends"

Referring to the Tongshan Cement Company the chairman stated that the assets were not included in the balance sheet, but that the company's position in regard to this was that they were creditors, and that the figure at which the debts stood on the books was one which was quite satisfactory to the company.

On the whole the report of the company is very encouraging, and the business in a very thriving condition. The shares of the company have advanced and have been sold at Tls. 10.60 in fairly large quantities. Most of the shares bought lately were to supply the London market.

RAILWAY BUILDING IN CHINA

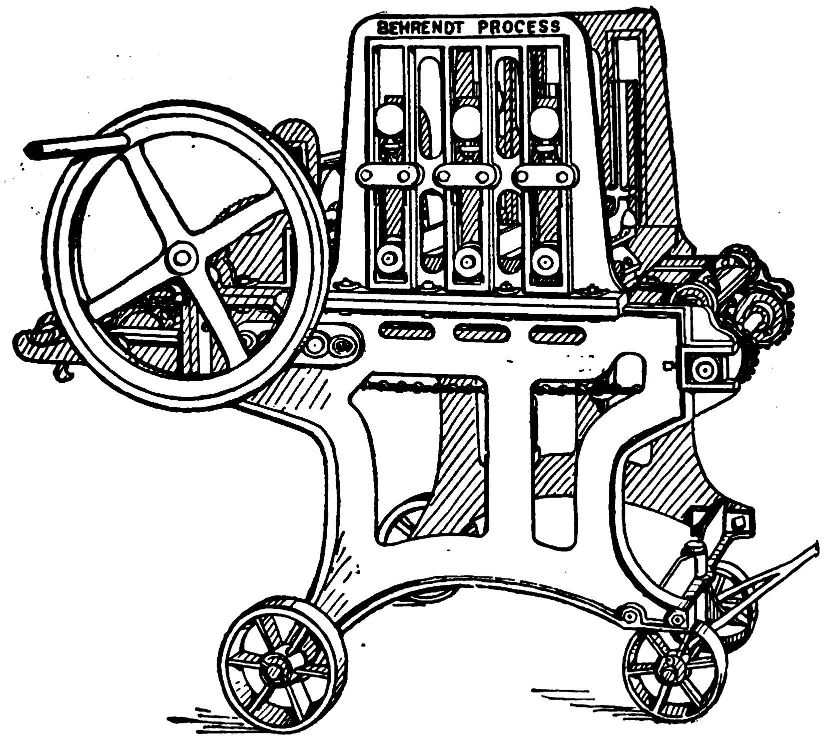
Brief mention has already been made in these columns, from time to time, of the dangers from disease and the difficulties of various kinds confronting the builders of the railway that is to pass through the Namti Valley in China. Now comes a report covering this same subject, issued by the Imperial Chinese Customs authorities of Mengtse. Consul T. Haynes, of Nanking, has forwarded it to Washington with the observation that it would seem as if China has her hands full of evils not unlike those encountered upon the Isthmus of Panama. The report of the Imperial Customs authorities is as follows:—

"The construction of the railway between Laokai and Yunnanfu (the great enterprise to which all well-wishers of Yunnan look forward as one of the means of permitting this province to take her proper place in the markets of the world) has been perseveringly pushed forward in the face of great difficulties both climatic and economic. The vile climate of the Namti Valley has levied a heavy toll on those who have dared to open up its primeval jungles and gullies. The death rate among the coolies imported from various parts of the Empire and put to work in this dreaded valley, may, without exaggeration, be estimated at 5,000, or 70 per cent of the total number employed on that particular section of the line. The company has made praiseworthy efforts to counteract the evils of the climate in this valley. They have constructed a large number of suitable dwellings both for foreigners and natives, and have doubled the number of hospitals, placing as many as seven doctors on the first 150 kilometers from Hokou. Instead of attempting to carry on the work in the Namti Valley all the year through the work is suspended almost entirely during the summer rains and the coolies moved up to the works on the high and healthier plateau. This measure, while it economizes the life of that most important individual in the building of any railway, namely, the coolie, must considerably delay the completion of the line, and we must therefore wait till 1910 at least for that great desideratum—the linking up of Yunnanfu with Haiphong. The year under review marks an important epoch in the history of French railway enterprise in Indo-China. On Christmas day the first locomotive reached Laokai on the Tonking Yunnan border, and it is hoped that the coming spring will see the commencement of a through railway service between Haiphong and Laokai."

BEHRENDT FIBER-EXTRACTING AND CLEANING MACHINE

The Behrendt fiber-extracting and cleaning machine, known as the *Behrendt Process*, is so far the only one of the many hemp machines which are being perfected and experimented with by various inventors, that is now actually working in the field, and giving practical and profitable results. Six machines have been in daily operation for the last four months in the hemp-fields of the Province of Albay, Luzon, P. I., so whatever assertions are made in this brief exposition of the invention are based upon the practical results obtained in actual service and experience in the field.

the same time the fiber is dried to such an extent that it requires only a few hours of exposure to the sun before it can be baled and shipped to the market. By this process the machine turns out long, round, clean, white and polished fiber of a lustrous and glossy appearance. The loss of fiber by the machine is estimated at from 3 to 5 per cent against the present native method where the loss is from 30 to 40 per cent. The average price that has been paid in Manila for the hemp produced by the machine has been between ₱23 and ₱27 ($11.50 and $13.50 gold) per picul.



BEHRENDT FIBER-STRIPPING AND CLEANING MACHINE, SHOWING ATTACHMENT FOR HAND-POWER OPERATION

The mechanism of the machine is very simple and can be handled by anyone, no technical knowledge being necessary. The machine can be worked either by hand or by steam, gasolene or petroleum power. Its capacity by hand is 50 lbs. of dry fiber per day; by other power 100 lbs. per day. One 2 h. p. gasolene or petroleum motor can run three machines, as each machine requires only ½ h. p.

The dimensions of the machine are as follows:—Length over all, 46″; width, 30″; height, 50″, and its weight is 1,000 lbs. It can be taken apart in 10 minutes and set up again, ready for business, in a half hour. It was built with a view to easy transportation in the mountainous country where the hemp-fields are located, and in so doing the expenses of transportation of the hemp trees to the machine, over the long, precipitous and tortuous mountain passes and trials, have been reduced to a minimum. The machine being thus adapted to the actual and existing conditions of the country, it can be worked at very much less expense than a stationary stripper and at a correspondingly greater profit. It can be adjusted to turn out any quality of fiber desired in the market, from the coarsest to the finest grades.

The *Behrendt Process* machine is especially adapted and constructed to permit a quick and thorough separation of the pulp and freeing the fibers without violence or injury to the latter, and at the same time cleaning the fibers entirely of the pulp. After the fiber has been cleaned in the manner just stated, before it passes out of the machine it runs through two rubber rollers which press out the tannic acid which is contained in the plant. This makes discoloration impossible and at

The advantages of the machine, condensed, are *(1)* its simplicity, anyone being able to handle it without technical knowledge; *(2)* its portability, which means easy access to the mountains and the material reduction of freight expenses; *(3)* the process, whereby the fiber can be regulated according to the demands of the market; *(4)* the systematic and safe way of extracting the fiber with a very small loss and without violence or injury to the same; *(5)* the safeguards against discoloration by the pressing out of the tannic acid; *(6)* the time gained in the drying of the fiber; and *(7)* the superior quality of fiber produced and the good prices it holds in the market.

The Behrendt machine is the property of Messrs. Behrendt & Co. This firm was organized under the laws of the State of New York, its headquarters being in New York City. The branch office in Manila for the Philippine Islands and the Far East is under the supervision of Mr. Gustave L. Solignac as General Manager. Another office was established in Ligao, Province of Albay, in the month of May, 1906. At this latter place the firm made its first introduction of its hemp machines, Ligao being the central point of most of the large hemp-fields in the Province of Albay. After they had demonstrated to the planters there what the machine could do Messrs. Behrendt & Co. found no trouble in putting the machines to work. Three camps have already been established on three of the largest plantations near Ligao—Camp Lopez Mataos, Camp Muñoz Mataos and Camp Boyer. In all of the camps the machines are working on full time. The firm has the honor of being the first in the field and also of having sent the first shipment of machine-stripped hemp to Manila in all the history of the Philippine Islands.

HONGKONG AND SHANGHAI BANK

Mr. A. Stephen, Ating Manager of the Manila branch of the Hongkong and Shanghai Bangking Corporation, has received the following telegram from the head office of the company in Hongkong:—

"Subject to audit and confirmation at the general meeting of shareholders, the dividend for the six months ended December 31st, 1906, will probably be £1 15/- per share with a bonus in addition of £1 per share; to be added to Reserve, $750,000; and carried forward to next half year Undivided Profits, $1,700,000.

"The directors have resolved to approach the Hongkong Government to amend the Bank Ordinance in order to provide for an increase of capital, and will recommend at an extraordinary general meeting, to be held later, the creation of 40,000 new shares of $125 each to be issued to the shareholders at the price of £35 in the proportion of one new share to two old shares."

The dividend proposed will, with that paid for the half year ended June 30th, make a total dividend of £4 10/- on each share of Mexican $125 for 1906.

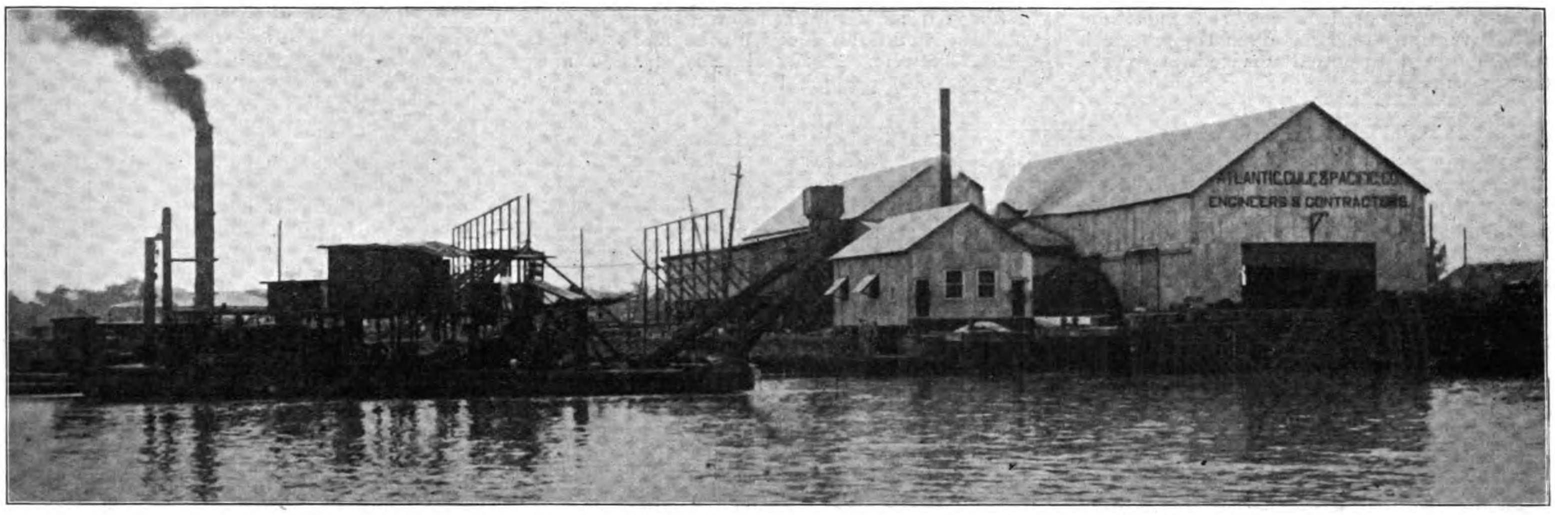
The proposed issue of new shares will raise the capital of the bank from $10,000,000 (Mexican) to $15,000,000 and the premium on the issue will amount to about $6,000,000 (Mexican) which, with the existing reserves of $21,000,000 (Mexican), will make the Capital and Reserve of the bank $42,000,000 (Mexican).

WESTERN AUSTRALIA RAILROADS

The railroads of Western Australia, one of the largest states of the Australian Commonwealth, are under Government control, as is the case with all the railways of the commonwealth. Although Western Australia's railway history begins at a date considerably later than that of any of the eastern states of the commonwealth, it is, according to a competent authority, as regards rapidity of construction and growth of traffic, unique in comparison with other systems. As distinguished from previous conditions, when the requirements and agricultural products of the older settlements formed the staple source of railway revenue, this more particularly applies to the last decade when the wonderful gold discoveries in the new districts rapidly developed a large and profitable business. The first railway line of the colony connecting Geraldton with the copper-mining district of Northampton was opened in 1879, and since then nearly 2,000 miles of rail have been laid. The standard gauge is 3′ 6″. The administration of all Government railways open for traffic is in the hands of the Commissioner of Railways. Under a parliamentary enactment of 1904 his responsibilities and powers were fully defined, and the practical operation of the department was removed as far as possible from the control of politicians. For the purpose of ordinary organization of operation the department is divided into four divisions, *viz*, the administration or general, the traffic, the locomotive, and the ways and works, the heads of which are practical railroad men and regarded as well equipped for the positions. The average number of men permanently employed is 6,000. The capital expended on the lines now open amounts to approximately $50,000,000 gold, and the percentage of profit on their operation is between 4.6 and 5 per cent on the money invested. Accidents are infrequent and have rarely resulted in loss of life. The telegraph and telephone systems are also owned by the Government, and have steadily grown in size and efficiency since their establishment. In Western Australia there are now approximately 175 telegraph stations and 10,000 miles of wire. In connection with the telephone exchange over 6,000 miles of wire are in operation, while the railway telephone lines operate nearly 8,000 miles of wire.

STEEL WORKS OF THE ATLANTIC, GULF AND PACIFIC COMPANY

The Atlantic, Gulf and Pacific Company, one of the largest engineering and contracting concerns of the United States and among the first of the big American corporations to extend their business to the Philippines, has just inaugurated a substantial and up-to-date steel works on the left bank of the Pasig River in that district of Manila known as Pandakan. This company has always displayed an abiding faith in the future industrial possibilities of Manila and the Philippine Islands, backing up this faith with the investment of substantial sums of money in large engineering plants and larger contracts, all of which capital is bringing most satisfactory returns through capable and aggressive management. The company's policy has in a measure been unique in that it has always depended almost entirely upon native labor for the accomplishment of its undertakings in the Islands, and so judiciously has this labor been handled that it has always proved reliable and efficient.



STEEL WORKS OF THE ATLANTIC, GULF AND PACIFIC COMPANY ON THE PASIG RIVER AT MANILA

A MODERN STEEL PLANT.—The steel works on the Pasig represent an ultimate expenditure of something like $150,000 gold. They occupy a tract of ground that is eight acres in extent, and the site is one of the best for manufacturing purposes to be found in Manila. The plant is fitted out with machinery to fabricate all classes of structural steel work, including bridges, buildings, water tanks—in fact everything built of structural steel. The latest and most modern power machinery, all of American make, has been installed, consisting of punches, shears, planers, lathes, drills, etc. The punches are of the multiple type, punching 17 holes in one motion. The shears are of the rotary type, and there are edge and face planers, cold cutoff saws, steam hammers, and other auxiliaries.

The building has its own electric lighting plant, and steam is furnished by two 300 h. p. boilers. A duplex steam driven air compressor provides compressed air, which is piped through the building, furnishing power for the pressure riveters and other air tools. All riveting, caulking, drilling, reaming, etc., is done with the air tools, and the big air compressor is fitted with automatic attachments which keep the air in the receiver at a uniform compression.

The main engines which drive the machinery are of the Atlas heavy-duty type.

PRODUCTS OF THE PLANT.—In addition to the structural steel work, machinery has been installed for the manufacture of all kinds and sizes of rivets, bolts and nuts, including railroad bolts and spikes. The merchants of Manila need no longer carry large stocks of rivets, bolts, and other such material as has heretofore been necessary, because the Atlantic, Gulf and Pacific Company is now prepared to furnish all such stock in any quantity at all times.

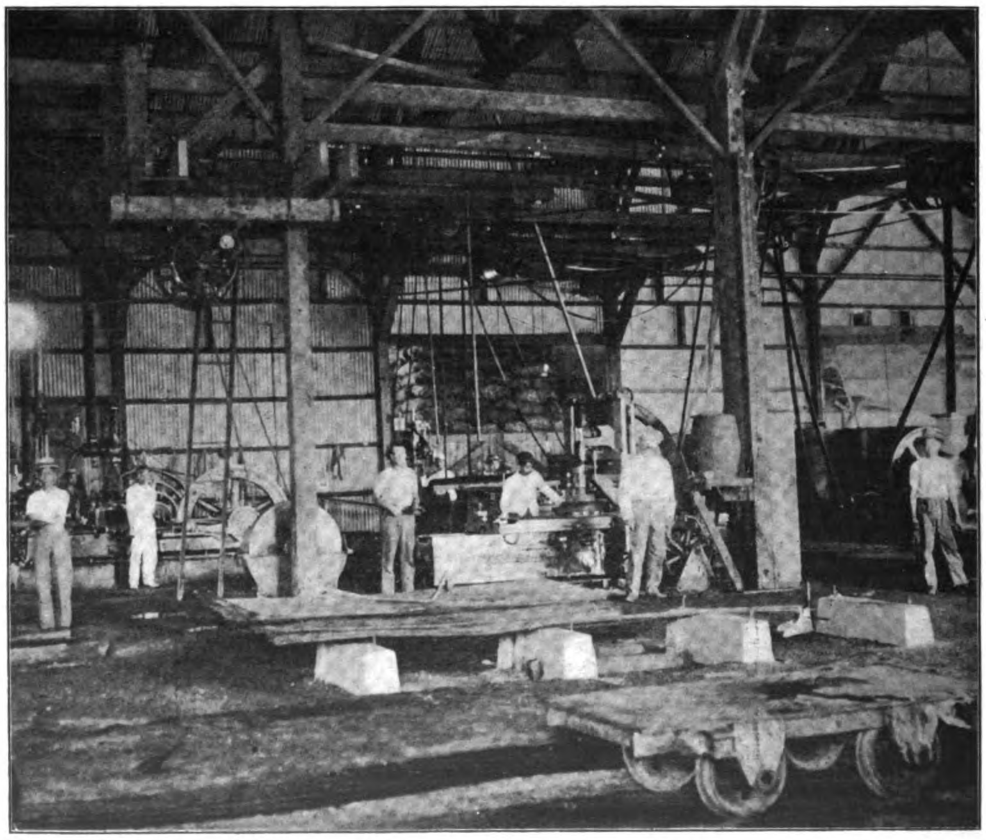
The Insular Government will also benefit largely from this plant, because it can have its bridges built at home, on native soil and by native workmen, for all the work at the plant is being done by Filipino workmen under American supervision.

SLIPWAY UNDER CONSTRUCTION.—Within the next six months a slipway, with modern appliances, will be installed and equipped for taking out and repairing small river craft, in addition to the company's own fleet of barges and launches which has now attained considerable size. The facilities for loading and unloading material at the plant are also superb, river craft being able to tie up alongside a spacious wharf on the bank of the Pasig directly in front of the works.

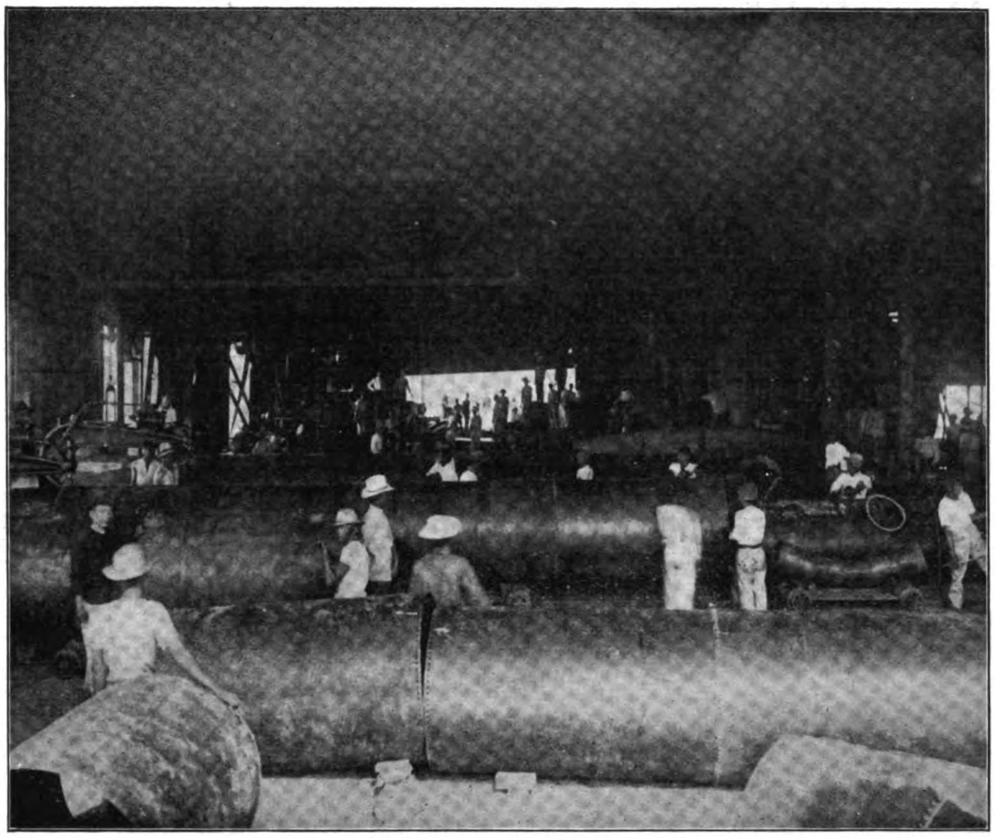
JAPAN'S TEXTILE MACHINERY

Mr. W. A. Graham Clark, special agent of the Bureau of Manufactures of the Department of Commerce and Labor, at Washington, reports that there is an excellent opening in Japan for the sale of power looms and describes the kinds of looms best adapted to the mills of that country. British manufacturers of cotton-mill machinery dominate in that field as in the supply of cotton goods, and some of the reasons for this domination are furnished by Mr. Clark.

At present Japan is a better field for the sale of machinery needed to make finished products than for the manufactured products themselves. In no line of business is this truer than in cotton manufacturing. Japan is straining every nerve to change from a consuming to a producing nation, and a great amount of money will be put into textile machinery the next few years. The tendency of all the mills is to add looms and make cloth for the export trade. The great market for the cloth of the kind that can readily be made by Japan in Manchuria and Korea has stimulated the weave mills, while the year business has to stand severe competition in China and Indian yarn, and at present the yarn market is dull. Many Japanese yarn mills are considering the question of changing to weave mills, and several have recently done so.



SECTIONAL INTERIOR VIEW OF THE WORKS



INTERIOR VIEW OF THE WORKS SHOWING WATER PIPE FOR THE NEW MANILA GRAVITY SYSTEM

There is at present a fine opportunity for American textile machine manufacturers to gain a foothold in Japan. The textile machinery market is dominated by the English to an even larger degree than the textile market. Reports from England are that textile machinery manufacturers are overwhelmed with orders and can not give quick delivery. Spinning machinery is being turned out at Oldham and elsewhere in vast quantities, and the shops are running overtime. The loom makers in Blackburn and Burnley are turning out more looms per month than ever before and are much behind in orders. Makers of reels, engines, and boilers, etc., are running behind in delivery. Much of this unprecedented activity in textile machinery factories in England is produced by the foreign demand, of which a good portion, like that from Japan, rightfully belongs on account of proximity to the United States.

The first mill in Japan that was a success had English machinery, and the other mills followed. Machinery from Oldham, Blackburn, Burnley, etc., is found in all the Japanese mills, but very little American. There is some prejudice against American textile machinery as being too high in price and too light in construction. Notwithstanding his dexterity in certain lines of manufacture the average Japanese is a very rough workman, and the managers therefore prefer heavy machinery from England instead of the really better-designed American, overlooking the fact that an eyebeam properly constructed is fully as strong as a solid bar, and that in such instances extra metal is useless.

That the English control the market for textile machinery is due entirely to the indifference of American manufacturers. The English, besides having their agencies, send experts out continually, and do everything possible to facilitate buying, American manufacturers paying little attention to the market and even not giving quotations when desired. A local American firm that handles machinery, a little while back, noting the amount of money going to England for textile machinery, wished to see if some of it could not be diverted to America. They accordingly wrote to one of the largest companies manufacturing looms in the United States of the big market, and asked for quotations to see if they could not profitably compete. The answer came back in due time that the firm appreciated his inquiry, but did not care to make any quotations unless they knew the name of the particular mill the machinery would be ordered for. Contrast this with what would have been the result if the circumstances had been reversed and application had been made to England.

The textile machinery imports are increasing rapidly, as shown by the following table:—

	1903.	1904.	1905.	First six months. of 1906.
Cotton-printing machinery....	$ 19,629	$ 17,980	$ 11,187	$ 19,403
Cotton-spinning machinery....	267,501	316,942	614,117	556,177
Cotton-weaving machinery ...	39,670	77.418	193,282	66,829
Total.....	326,800	412,340	818,586	642,409

Of the $818,586 worth for 1905 there was shipped from the United States only $14,613 of cotton-spinning and $22,512 of cotton-weaving machinery.

There are several new factories being projected, and established mills are enlarging, so if the question of raising more revennue is solved by the Diet without burdening manufacturing too much, there will probably be between 50,000 and 100,000 new spindles installed during 1907. The Kanegafuchi Spinning Company, whose head office is at Kobé, intends to send its superintendent to England to select machinery for a large new mill they have decided to erect at Harima and which they intend to make a model mill.

A new million-dollar mill to be known as the "Oriental" is to be shortly established near Amagasaki, Setsu Province, for weaving calico. The proposed equipment is 500 looms, 20,000 spindles for No. 42 yarn and 10,000 spindles for finer yarn. Mr. Kibuchi Kyozo, of Osaka, has charge of the enterprise.

The Fuhushima mill at Osaka has decided to add 20,000 spindles so as to increase its yarn production for shipment to China.

Several other mills are now being organized and others are ordering additional machinery. Most of these orders will be placed this fall for spring shipment, and it affords a good chance for the introduction of American spindles and looms, as previously explained.

There is a prejudice among Japanese mill managers against American textile machinery. They assert that it is higher in price, lighter in construction, and takes more repairs. The mills were equipped with English machinery and were at first operated by Englishmen, and the Japanese naturally cling to what they have been accustomed, but if American manufacturers seize the present opportunity to get a foothold in the market and to prove the labor-saving qualities of the American textile machinery this prejudice can be removed.

For the last year the Kanegafuchi Spinning Company, which is the largest in Japan and operates 218,080 spindles, has been conducting at its head mill in Kobé an experiment to determine the best loom. It installed 100 looms, of which 10 were plain looms from Draper Company, Hopedale, Mass.; 30 plain looms from Platt Brothers (Limited), Oldham, England; 12 Platt looms with warp stop motions; 30 plain looms from the Toyoda Shokwai Company at Nagoya, Japan; and 18 Toyoda looms with warp stop motions.

The trial resulted in favor of the English looms without stop motions and looms have been ordered from England to replace the Japanese looms.

The 100 looms have been running on 44 by 44, 36", 3½-yard shirting, making cuts 40 yards long, weighing 13 lbs. The yarn was a mixture of Indian, Chinese, and American. In blending three cottons of differing length of staple, different color, different texture and feel, and different spinning qualities, great skill is shown by the Japanese, but it is impossible for the resulting yarn to be as strong as yarn made from pure American cotton; and if too much twist is put in it kinks too badly. For this reason warp stop motions cause too much stoppage of the loom for coarse plain cloth, and are very much opposed by the operatives.

The American looms were given a black eye at the start by coming out in a broken-up condition due to bad packing and to rough handling, while the English looms arrived ready for work. While admitting that the American loom with American operatives is all right, the main argument made by the Japanese against its use is that it is badly designed for this market and that, as compared with the heavier English make, the breakage is excessive. This is due to the rough handling that is given the looms by Japanese operatives and loom fixers. The Japanese loom is inferior in weaving qualities and could not stand the usage.

Owing to the many mills now changing or proposing to install looms, the Kanegafuchi will probably remain on yarn, though there is talk of its building a shirting factory to replace English shirting. It is the largest mill in Japan, however, so the results of the tests are important for their effect on other mills. The present price of American plain looms is about -Y-185 c.i.f. and English -Y-170.

One Japanese cotton mill, the Tsushima Spinning Company in Owari Province in Central Japan, operates 100 looms on 1 shaku print cloth, but the majority of the immense quantity of narrow prints made and used so extensively for kimonos are made on hand looms. The price is from -Y-1.80 to 2.80 per bolt, or 4½ to 7 cents per yard. In addition to the narrow cotton prints, which were the main exhibit of cotton piece goods, there were also interesting exhibits of the goods made in the mills in Japan, comprising mostly gray sheetings, drills, T cloth, cotton crape, and cotton flannel, also some duck and shirtings and twills.

YALU LUMBER BUSINESS.—According to the Peking Treaty the lumber business on the banks of the Yalu River is to be a coöperative enterprise of Japanese and Chinese. It has been decided to establish a coöperative company with a capital of about $1,750,000 gold, to be equally divided between the two nationalities. As soon as the conditions, which have been forwarded to the Chinese Government by the Foreign Office of the Japanese Government, are accepted, the latter Government proposes to appoint a special inauguration committee similar to that of the South Manchurian Railway Company and proceed with floating the company.

Mechanical Tests, Properties and Uses of Philippine Woods

Mr. Rolland Gardner, manager of the timber-testing laboratory of the Bureau of Forestry of the Philippine Government, has compiled some interesting facts covering mechanical tests and the properties and uses of 30 Philippine woods, together with data regarding the local sawmills and the lumber market, and prices. The whole has been published in the form of a bulletin in response to numerous inquiries concerning Philippine woods and milling operations in the archipelago. The results of the timber tests represent the present knowledge of the subject and are not to be considered final, for such results can be obtained only from a large number of tests of properly identified botanical material from many localities and habitats. With two exceptions, the woods tested have been representative of the commercial material found on the market and are fair samples of those used by contractors and engineers. Indeed, in many instances they represent more approximately an average of the actual material used in construction than woods collected with botanical specimens might do. Nevertheless the value of mechanical tests on properly determined material obtained from districts where logged is not underestimated by the bureau, and such tests will be made as rapidly as possible.

QUALITIES OF WOODS AND MEANING OF TIMBER TESTS.—Every woodworker knows, says Mr. Gardner, more or less of the properties of the various kinds of woods which come under his observation, but this knowledge is usually gained by long experience. He may know that certain woods are strong or stiff, but he seldom learns from his own experience how strong or stiff they are. For this reason the design of structures is often a matter of guesswork, the designer or builder not having experimental data regarding the strength, stiffness and other properties of timber. In the timber testing laboratory these various properties and characteristics are studied and the results are collected in such form that others may use them to determine the fitness of woods for certain purposes.

Timber, as a material of construction, is required to resist various stresses. A short, thick column must resist simple compression along the grain. A railroad tie must resist compression across the grain where the rail rests upon it, and also shearing across the grain by the edges of the rail. Simple tension and shearing along the grain are not common in practice, although these stresses frequently occur in combination with other stresses, as in cross bending. It is possible to subject timber to any one of the above mentioned stresses, but it is much more common in practice that timber must withstand a number of these stresses at the same time.

Timber also possesses such properties as stiffness, hardness, toughness, flexibility, etc., which are all important in determining the fitness of any wood for certain purposes. Strength and stiffness are measured in pounds per square inch, but no satisfactory units have yet been proposed by which such properties as hardness and toughness may be measured.

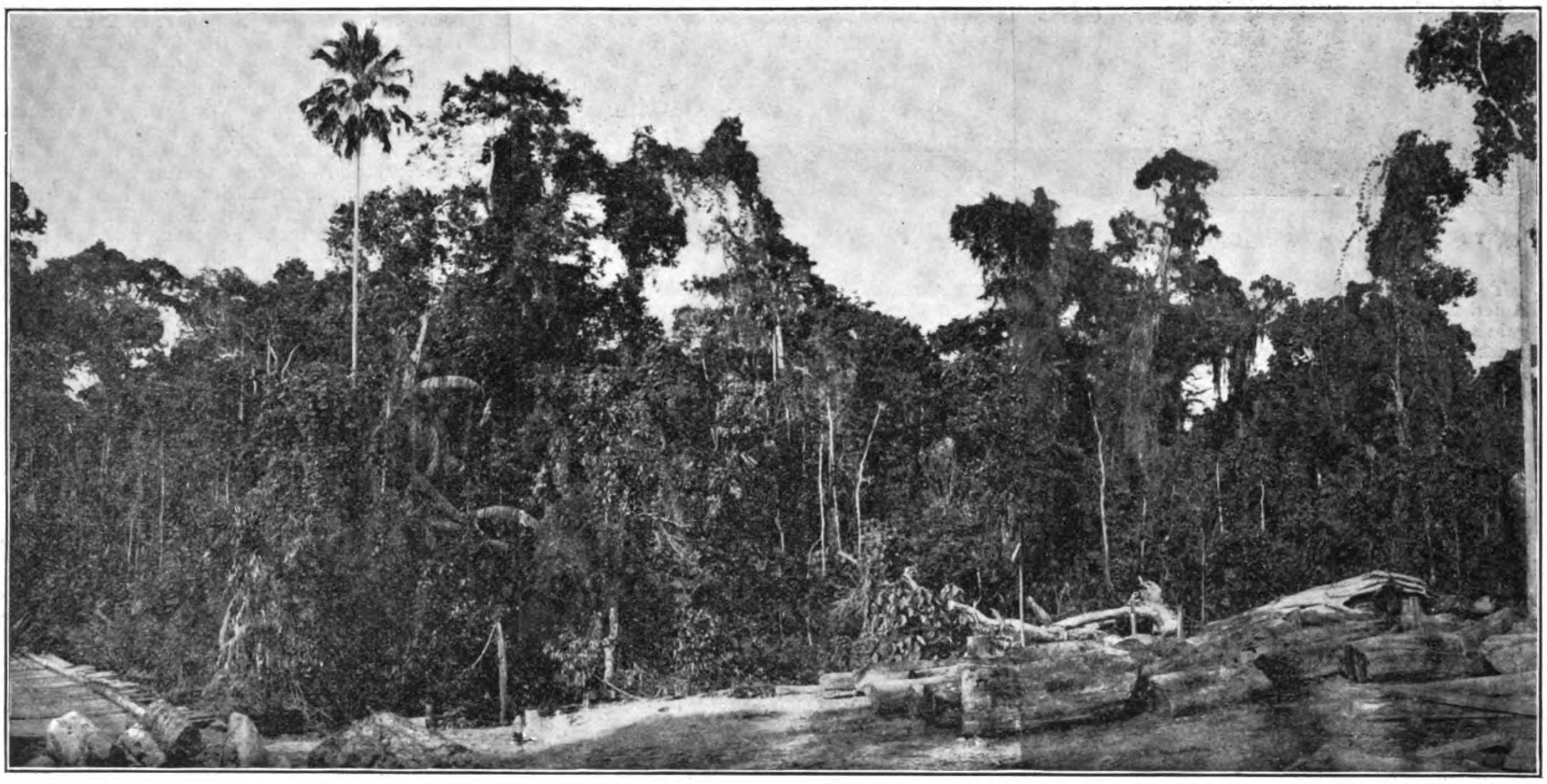
The beam is one of the most common members in general construction and the stresses involved are most complex. Suppose we have a beam 4×4″ in section, 5′ long, and supported at each end. At the middle of this beam a load of 500 lbs. is applied and the beam bends 1-16″ at the middle; another 500 lbs. bends it 1-16″ more, and soon until a point is reached where an added 500 lbs. produces an additional deflection of more than 1-16″. Here the true elastic limit is reached, or, to state this little more accurately, the true elastic limit is reached when flection is no longer proportional to load. This is approximately the point where the material begins to be injured, and if a beam is loaded beyond this point it will not return to its original condition when the load is removed. Even small loads produce some permanent set or bend in beams, but the true elastic limit is important as showing approximately the point where injury begins. Thus the true elastic limit is located. Now what do the (average) figures mean which are tabulated under "Fiber stress at the true elastic limit, pounds per square inch?" Evidently not the load on the beam when the true elastic limit was reached, for that would be applicable only to a beam of the same size, under exactly the same conditions as the one tested. To answer this question, it is necessary to examine the stresses produced.

As the beam is bent, its curve is approximately the arc of a circle. The bottom of the beam becomes longer and the top shorter, therefore the bottom is in tension and the top in compression. Upon the supposition that these stresses are equal, the average stress at the extreme top and bottom of the beam is computed and is tabulated under "Fiber stress at true elastic limit, pounds per square inch."

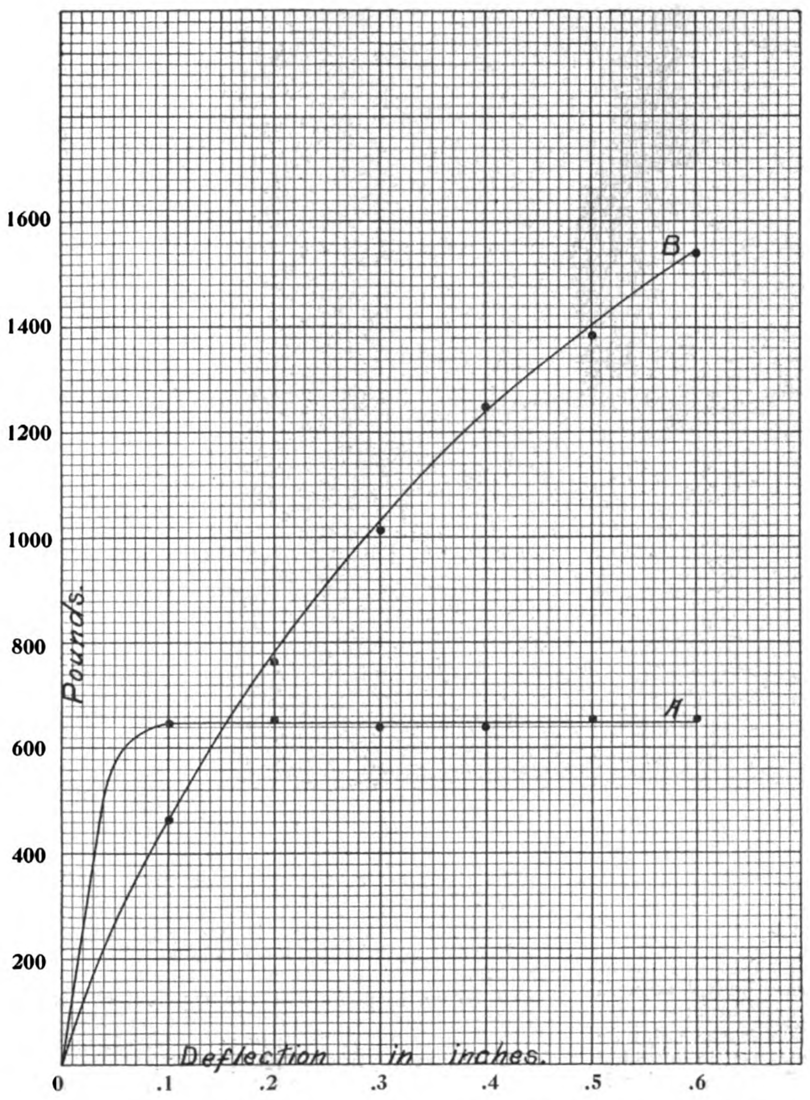
Fiber stress at apparent elastic limit and modulus of rupture, as tabulated, are also approximate stresses at the extreme top and bottom of the beam. The apparent elastic limit is a point a little higher than the true elastic limit. It is located arbitrarily, as explained under "Methods of testing and results of tests," and has no particular significance, although it was used extensively in early timber tests. The true elastic limit may be considered as a limit of safety and the modulus of rupture as the greatest stress which the wood will stand in cross bending. In practice, the fiber stress is always kept much lower than the fiber stress at the true elastic limit.

No attempt is made to measure brittleness and toughness, but in crossbending tests a brittle wood may be distinguished from a tough wood by the relation existing between the true elastic limit and rupture, for in brittle woods the amount of bending is small between the true elastic limit and rupture, while in tough woods it is great. Most Philippine woods are brittle, Dungon and Malugay being the only ones which have been investigated and found to possess the property of toughness to any considerable degree. These two, however, are quite tough and compare favorably with White Oak for bending by steaming. Woods like Molave, Calantas, Ash, and Pine are brittle, while those like Malugay, Dungon, Elm, Hickory, and Oak are tough.

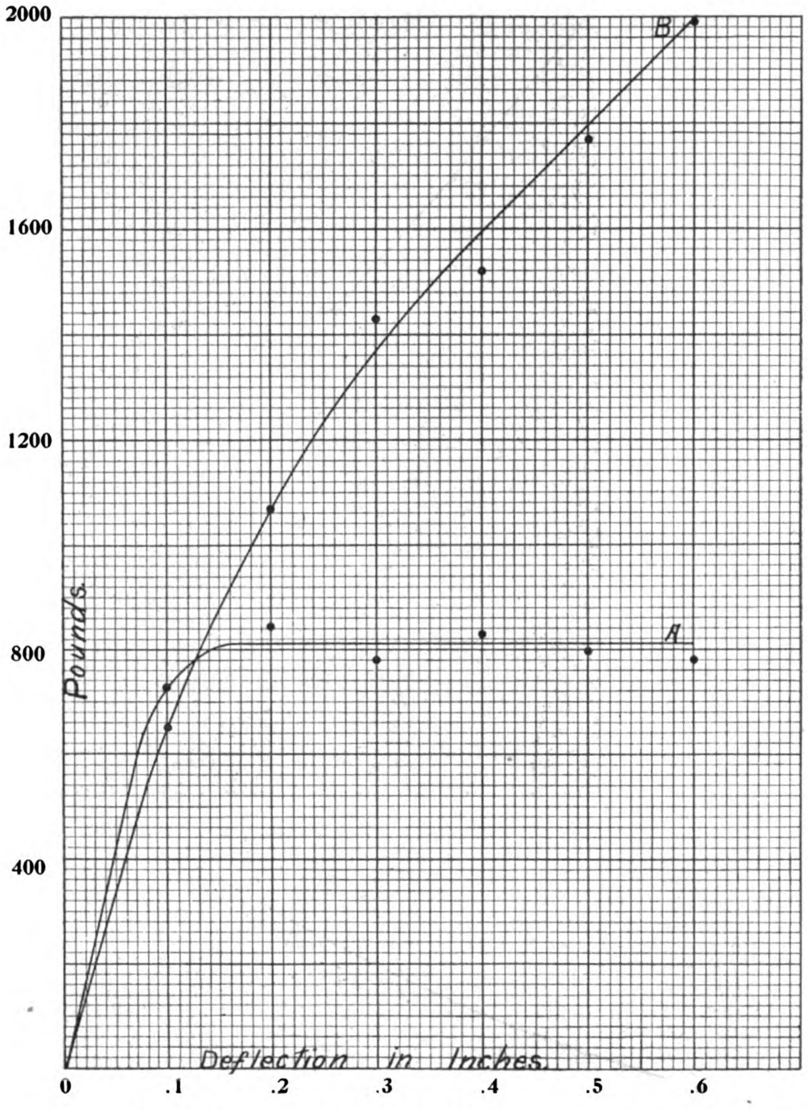
The modulus of elasticity is the measure of the stiffness of a material. If a beam of one kind of wood has a modulus of elasticity of 1,000,000 lbs. per square inch, and a second beam of another kind has a modulus of elasticity of 2,000,000 lbs. per square inch, the second wood is twice as stiff as the first, and if the two beams are of exactly the same dimensions, the first beam will bend twiec as far as the second



GENERAL VIEW OF THE NARRA FOREST TYPE, PHILIPPINE ISLANDS



COMPRESSION ACROSS THE GRAIN—LAUANG GROWN IN MINDANAO—18 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 35.5; AVERAGE SPECIFIC GRAVITY (DRY), 0.441



COMPRESSION ACROSS THE GRAIN—APITONG GROWN IN MINDANAO—23 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 36; AVERAGE SPECIFIC GRAVITY (DRY), 0.632

under a given load. For example, Yacal and Guijo are among the stiffest Philippine woods, being aproximately twice as stiff as woods like Banuyo and Calantas. (*See Table I.*)

Now consider two similar beams of the same material, supported at each end and loaded in the middle. If beam No. 1 is made twice as long as beam No. 2, other dimensions being the same, it will bend eight times as far under a given load but will be only half as strong. If beam No. 1 is made twice as high as beam No. 2, other dimensions remaining the same, it will bend only one-eighth as far under a given load but will be four times as strong. If beam No. 1 is made twice as wide as beam No. 2, other dimensions remaining the same, it will bend only one-half as far but will be twice as strong. If the beams are of the same dimensions throughout and the load on beam No. 1 is double that on beam No. 2, beam No. 1 will bend twice as far.

A strong wood is not necessarily stiff, nor is a stiff wood necessarily strong, although in many cases these properties appear to be closely related. By referring to Table I, it is seen that the Betis, from Tayabas, which was tested, was about 60 per cent stronger in cross bending than that from Ambos Camarines, although it was not quite as stiff. With few exceptions timber is much stronger when dry than when green. The weight of moisture in timber just from the saw is often from 80 to 90 per cent of the weight of the wood itself. This amount of moisture may be reduced to 30 to 35 per cent of the weight of dry wood, without showing any increase in strength, but when the wood is dried beyond this point the strength usually increases quite rapidly, well-seasoned timber frequently being from 50 to 70 per cent stronger than green timber.

As wood dries, the fibers become harder, stiffer, and stronger, but the wood also shrinks, which causes checks that tend to weaken the timber. In most woods this latter effect is much less than the former and the wood shows a decided increase in strength and stiffness, but in hard brittle woods the checking effect is quite serious. The tendency to check while seasoning may be overcome to a large extent by drying slowly and evenly, but in large timbers the outer surface dries months or even years before the interior, so that it is practically impossible to prevent checking. This is one reason why the strength values for large timbers are somewhat smaller than for small timbers.

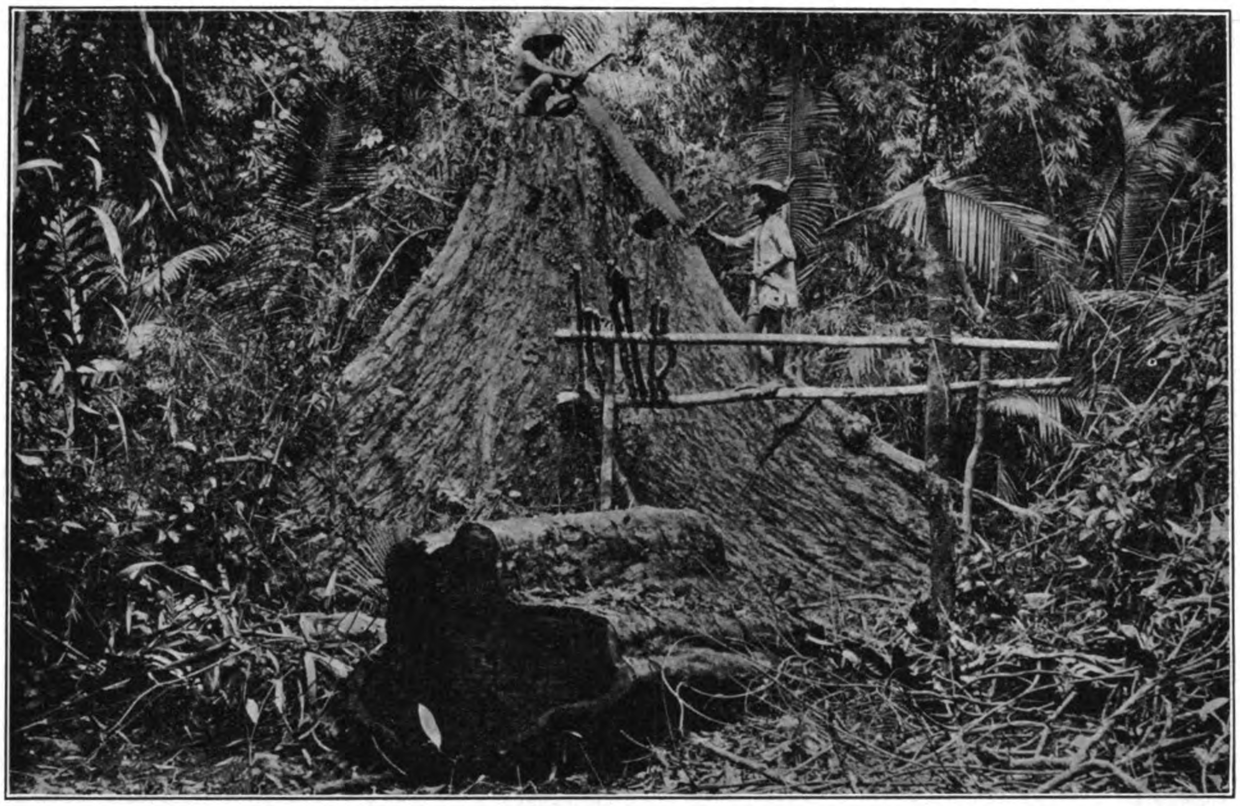
Timber is thoroughly seasoned when it contains 10 to 12 per cent moisture throughout, and will ariveat that percentage of moisture in time if exposed to air but protected from rain and sun. If it is made drier than this by artificial means, it will reabsorb moisture from the atmosphere until it arrives at 10 to 12 per cent moisture. There is considerable variation in the moisture content of timber seasoned by artificial means. Usually timber whose moisture content is less than 20 per cent will pass for seasoned timber.

In tropical countries the most desirable quality sought in wood is durability. This is true because the destructive elements to timber are greater than in temperate regions. Because of continuous heat and moisture, fungus growth is undoubtedly more rapid in the Tropics. The universal presence of the white ant is perhaps the most destructive element that makes the use of durable timber almost imperative for railroad ties and for general construction purposes. Such timbers as are used for ties in cold regions would not last nearly as long here as there, but some of the best native woods are extremely durable. In temperate zones ten years is considered a long life for an untreated tie, but in these Islands the extremely durable woods, like Ipil and Molave, are known to have been in the ground for more than ten years without any sign of decay. The ravages of the sea worm (*teredo*) restrict the use of untreated timber, in contact with salt water, to those species that are especially adapted to resisting the attacks of this enemy. The softer Philippine woods, like Lauan, and imported woods, like Oregon Pine, are quickly destroyed when placed in salt water, while Aranga and Betis are highly valued because of their great durability under these conditions.

It being impracticable at the time these tests were started to secure timber which had been botanically determined, this series of tests was made almost entirely upon timber purchased in the market. The Sacat and Balacat, which were obtained at the Lamao Forest Reserve, were the only woods which were not secured in the market. In buying care was exercised to select timber which well represented the quality generally used in construction. Most of the timber tested was clear and sound.

No standard rules for the inspection of timber are in use in Manila by which the quality and condition of the timber tested may be described. All blocks used for compression and shear tests were clear and sound.

METHODS OF TESTING AND RESULTS OF TESTS. —The machine used in making the following tests is a Tinius Olsen testing machine, with a capacity of 200,000 lbs.



CUTTING OUT A TABLE TOP FROM A BUTTRESS OF NARRA, DELTA OF THE BONGABON RIVER, EAST COAST OF MINDORO

All beams used for cross-bending tests (Table I) were either $3\frac{1}{2}\times3\frac{1}{2}''$ or $4\times4''$ in section, with a span of 60". The machine was operated at a speed of 0.3" per minute and the deflection was noted at various loads during the tests. The curve was then plotted between deflection in inches and load in pounds, and upon this curve were located the true elastic limit, the apparent elastic limit, and the point at which failure occurred.

The fiber stress at the true elastic limit was calculated by the standard formula:—

Fiber stress at true elastic limit $= \frac{3WL}{2\,B\,H^2}$ where

W=load in pounds at true elastic limit,

L=span in inches,

B=breadth of beam in inches,

H=height of beam in inches.

The term "apparent elastic limit," as used in this bulletin, is defined as follows:—

"The apparent elastic limit is the point on the stress diagram of any material in any kind of a test at which the rate of deformation is 50 per cent greater than it is at the origin."

The fiber stress at the apparent elastic limit and the modulus of rupture were determined by the same formula which was used to determine the fiber stress at the true elastic limit, *viz:*—

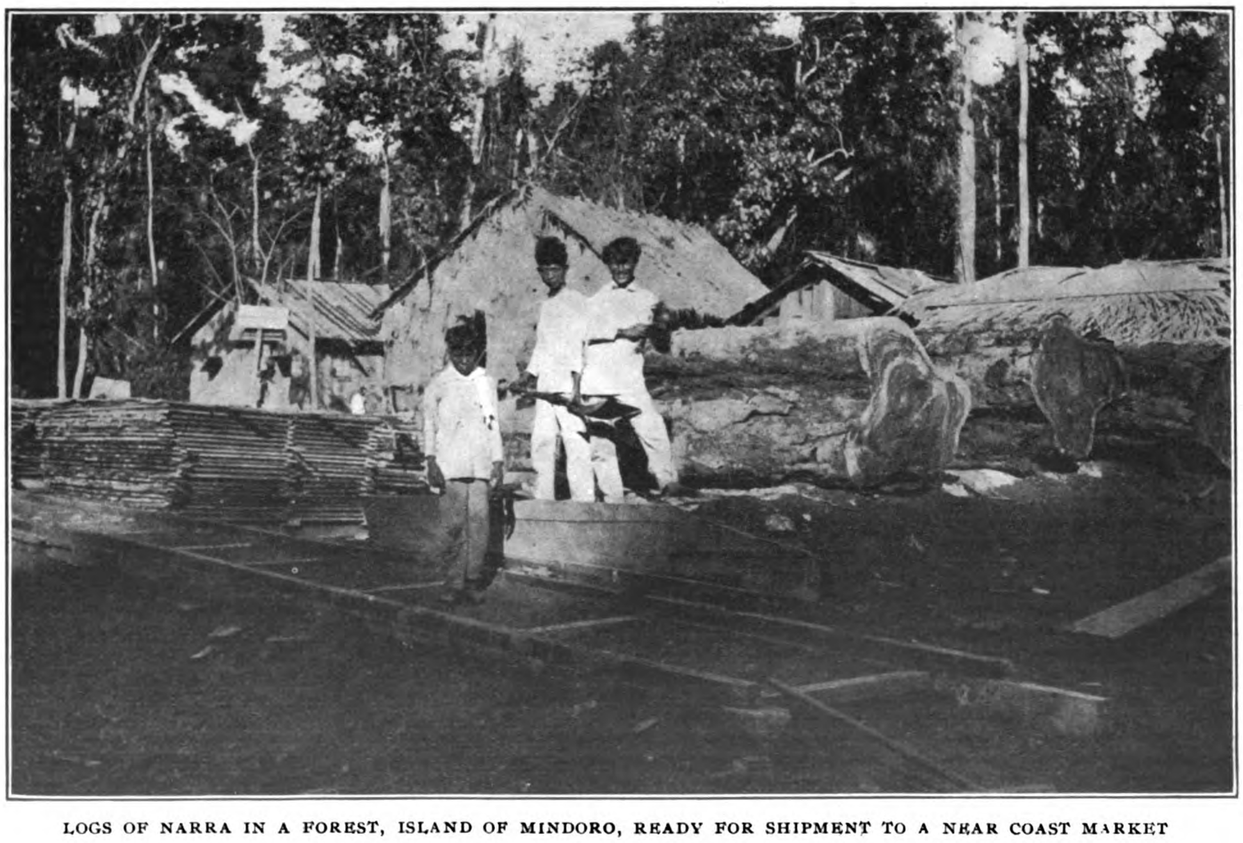
Fiber stress at the apparent elastic limit $= \frac{3\,W'\,L}{2\,B\,H^2}$ where,

W'=load in pounds at the apparent elastic limit; and

Modulus of rupture $= \frac{3\,W''\,L}{2\,B\,H^2}$ where,

W''=load in pounds at rupture.

Plate I shows the true elastic limit and the apparent elastic limit as located upon a typical stress diagram.



LOGS OF NARRA IN A FOREST, ISLAND OF MINDORO, READY FOR SHIPMENT TO A NEAR COAST MARKET

After the stress diagram was drawn, a tangent was drawn to the curve at the origin and the modulus of elasticity was determined by the following well-known formula:—

Modulus of elasticity$=\frac{W L^3}{4 D B H^3}$ where,

W=the load corresponding to some point on the tangent,

D=the deflection in inches corresponding to the same point,

B=the breadth of beam in inches,

H=the height of beam in inches,

L=the span in inches.

After the cross-bending test, the beams were cut up for compression tests, shear tests, and moisture determinations.

The blocks for tests in compression along the grain (*Table II*), were either $3\frac{1}{2}\times3\frac{1}{2}''$ or $4\times4''$ in cross section and 8″ high. The machine was operated at a speed of 0.06″ per minute and the load was increased until the blocks showed signs of failure by wrinkling on the sides.

TABLE I.—*Average Cross-Bending Strength of Philippine Timber*

Name.	Locality.	Moisture over 35 per cent.						
		Number of tests.	Moisture (per cent).	Specific gravity of dry wood.	Fiber stress at true elastic limit (pounds per square inch).	Fiber stress at apparent elastic limit (pounds per square inch).	Modulus of rupture (pounds per square inch).	Modulus of elasticity (1,000 pounds per square inch).
Lauan	Mindanao	38	51.8	0.444	2.630	4,570	6,870	1,464
Do	Zambales	36	63.	.478	5,260	6,410	8,040	1,438
Apitong	Mindanao	52	53.9	.62	3,750	5,550	7,350	1,754
Do	Zambales	30	55.8	.679	5,220	6,790	8,910	1,428
Guijo	Ambos Camarines	27	43.7	.677	6,330	8,660	12,050	1,915
Do	Mindoro	49	57.8	.696	6,420	8,780	1,350	1,825
Molave	Laguna de Bay	47	45.5	.772	4,870	8,380	10,610	1,503
Do	Amb. Camarines	29	54.4	.782	6,840	8,640	10,380	1,381
Yacal	......do	21	43.3	.823	7,270	10,160	13,070	2,079
Narra	Laguna de Bay	11	79.	.563	3,000	6,300	8,390	1,509
Do	Cagayan	11	51.8	.63	6,020	7,960	10,220	1,352
Tanguile	Unknown	8	39.9	.536	5,180	6,780	9,160	1,576
Do	Zambales	27	47.7	.457	4,010	4,980	6,380	1,241
Sacat	Bataan	8	48.5	.561	3,340	5,030	6,960	1,584
Do	Tarlac	42	55.2	.60	5,800	7,050	9,300	1,569
Ipil	Amb. Camarines	19	52.7	.79	4,360	6,690	7,960	1,295
Do	Mindoro	44	63.1	.67	5,450	7,430	9,410	1,226
Do	Palawan	41	52.2	.807	9,170	11,210	13,520	1,953
Dungon	Amb. Camarines	6	42.2	.824	5,660	7,400	11,770	1,680
Do	Masbate	3	36.3	.827	4,730	6,420	10,250	1,593
Do	Mindanao	21	49.4	.668	4,520	5,740	7,870	1,317
Malasantol	Unknown	21	66.2	.633	4,500	6,480	8,690	1,518
Supa	......do	5	37.3	.673	6,410	8,180	10,050	1,435
Do	Tayabas	12	38.7	.755	4,890	7,170	8,700	1,415
Balacat	Bataan	9	56.1	.517	5,120	6,280	8,540	1,293
Do	Tarlac	21	45.4	.56	5,210	6,200	7,780	1,221
Macaasin	Unknown	35	68.4	.695	4,370	6,120	8,660	1,416
Calantas	Albay	15	75.4	.357	3,000	4,240	5,650	.961
Do	Mindoro	10	57.3	.511	3,560	4,900	6,250	.940
Tindalo	Unknown	6	40.4	.747	8,090	10,770	15,000	2,226
Do	Amb. Camarines	12	44.7	.808	7,070	9,700	11,330	1,588
Do	Masbate	10	59.	.77	5,290	7,690	11,200	1,536
Amuguis	Mindoro	31	46.1	.692	4,490	6,800	9,780	1,697
Acle	Tarlac	41	92.5	.632	3,920	6,000	7,270	1,069
Do	Zambales	6	96.8	.579	5,900	7,010	9,080	1,213
Betis	Tayabas	7	38.1	.849	5,780	8,460	11,910	1,768
Do	Amb. Camarines	30	61.6	.725	3,670	5,620	7,450	2,035
Bansalaguin	Unknown	18	46.2	.841	6,820	9,420	11,740	1,702
Palo Maria	Zambales	24	56.	.623	5,840	7,040	8,930	1,461
Batitinan	Unknown	10	54.4	.777	4,540	6,350	9,320	1,427
Banuyo	Masbate	16	82.	.522	2,900	4,170	5,140	881
Balacbacan	Occ. Negros	9	40.	.538	5,410	6,320	8,180	1,280
Mayapis	Laguna	20	67.7	.399	4,070	5,320	6,760	1,133
Malugay	Mindoro	18	57.2	.635	4,780	6,930	10,280	1,627
Liusin	Bataan	14	60.9	.71	5,430	8,120	11,360	1,896
Lumbayao	Basilan Islands	2	37.1	.545	5,620	6,460	7,790	1,160

TABLE II.—*Average Compressive Strength Along the Grain of Philippine Timber.*

Moisture over 35 per cent.

Name.	Locality.	Number of tests.	Moisture (per cent.)	Specific gravity of dry wood.	Stress at rupture (pounds per square inch).
Lauan	Mindanao	67	52.4	0.444	3,840
Do	Zambales	70	59.5	.478	4,180
Apitong	Mindanao	98	53.	.617	4,350
Do	Zambales	60	53.4	.679	5,010
Guijo	Amb. Camarines	50	41.8	.675	6,070
Do	Mindoro	98	55.7	.697	6,070
Molave	Laguna de Bay	78	46.4	.772	6,680
Do	Amb. Camarines	50	50.5	.784	6,530
Yacal	......do	34	46.7	.828	7,490
Narra	Laguna de Bay	20	77.7	.563	5,780
Do	Cagayan	18	55.9	.619	5,300
Tanguile	Unknown	18	40.5	.53	4,750
Do	Zambales	54	44.1	.46	3,980
Sacat	Bataan	14	49.8	.561	4,530
Do	Tarlac	74	53.1	.60	5,260
Ipil	Amb. Camarines	36	52.9	.796	5,650
Do	Mindoro	84	60.4	.666	5,450
Do	Palawan	79	51.4	.807	8,090
Dungon	Amb. Camarines	6	44.1	.803	6,160
Do	Masbate	6	36.9	.825	4,540
Do	Mindanao	38	50.7	.669	4,000
Malasantol	Unknown	40	64.4	.631	4,660
Supa	......do	8	36.1	.677	6,480
Do	Tayabas	10	37.2	.746	5,090
Balacat	Bataan	16	52.6	.517	4,020
Do	Tarlac	40	44.7	.56	4,150
Macaasin	Unknown	76	63.9	.703	4,350
Calantas	Albay	28	77.3	.357	2,960
Do	Mindoro	18	57.3	.51	3,810
Tindalo	Unknown	12	41.9	.747	7,400
Do	Amb. Camarines	23	43.9	.80	7,140
Do	Masbate	20	56.7	.77	5,930
Amuguis	Mindoro	54	45.2	.692	5,210
Acle	Tarlac	27	84.5	.631	4,550
Do	Zambales	12	94.9	.579	5,330
Betis	Tayabas	14	38.2	.854	6,540
Do	Amb. Camarines	60	59.5	.725	4,330
Bansalaguin	Unknown	34	43.	.841	6,960
Palo-Maria	Zambales	40	50.2	.618	4,770
Batitinan	Unknown	18	54.9	.777	4,650
Banuyo	Masbate	30	77.9	.527	3,290
Balacbacan	Neg. Occidental	4	43.	.546	4,410
Mayapis	Laguna	40	63.5	.399	3,530
Malugay	Mindoro	34	55.8	.635	5,120
Liusin	Bataan	8	60.9	.71	5,220

SHEAR ALONG THE GRAIN.—The pieces used for shear tests were either $1\frac{1}{2}$ or $1\frac{3}{4}''$ thick. 3″ wide, and 18″ long. Just 1″ from one end of the piece a hole was cut $\frac{5}{8}\times1''$, through which a rectangular steel bar was placed. The opposite end of the test piece was then gripped in the upper jaws of the machine and the load was applied on the steel bar until the material directly under it was sheared out. It will be seen that this arrangement produces double shear, the area being either 3 or $3\frac{1}{2}$ square inches, depending upon the thickness of the piece. For these tests the machine was operated at a speed of 0.3″ per minute.

TABLE III.—*Average Shearing Strength Along the Grain of Philippine Timber.*

[Results averaged regardless of moisture content.]

Name.	Locality.	Number of tests.	Specific gravity, dry wood.	Stress at rupture (pounds per square inch).
Lauan	Mindanao	142	0.446	557
Do	Zambales	69	.478	525
Apitong	Mindanao	150	.645	669
Do	Zambales	62	.687	757
Guijo	Ambos Camarines	110	.708	915
Do	Mindoro	98	.697	824
Molave	Laguna de Bay	129	.784	914
Do	Ambos Camarines	51	.784	839
Yacal	......do	150	.843	849
Narra	Laguna de Bay	20	.563	678
Do	Cagayan	59	.54	660
Tanguile	Unknown	70	.471	647
Do	Zambales	86	.491	555
Sacat	Bataan	14	.561	776
Do	Tarlac	132	.616	850
Ipil	Ambos Camarines	79	.793	904
Do	Mindoro	90	.673	948
Do	Palawan	80	.807	753
Dungon	Ambos Camarines	98	.852	1,253
Do	Masbate	46	.85	1,298
Do	Mindanao	44	.669	855
Malasantol	Unknown	54	.646	720
Supa	......do	86	.71	898
Do	Tayabas	118	.813	852
Balacat	Bataan	16	.517	486
Do	Tarlac	117	.578	692
Macaasin	Unknown	92	.717	916
Calantas	Albay	34	.358	526
Do	Mindoro	35	.527	778
Tindalo	Unknown	20	.763	1,004
Do	Ambos Camarines	56	.805	911
Do	Masbate	36	.772	905
Amuguis	Mindoro	60	.692	824
Acle	Tarlac	36	.63	686
Do	Zambales	11	.579	778
Betis	Tayabas	38	.856	1,168
Do	Ambos Camarines	61	.728	819
Bansalaguin	Unknown	48	.85	1,098
Palo Maria	Zambales	46	.623	856
Batitinan	Unknown	26	.795	859
Aranga	Ambos Camarines	82	.863	1,038
Banuyo	Masbate	38	.525	596
Balacbacan	Negros Occidental	34	.543	689
Mayapis	Laguna	40	.399	472
Malugay	Mindoro	78	.658	980
Sasalit	Zambales	75	.872	1,176
Liusin	Bataan	8	.71	886
Lumbayao	Basilan Island	104	.565	827

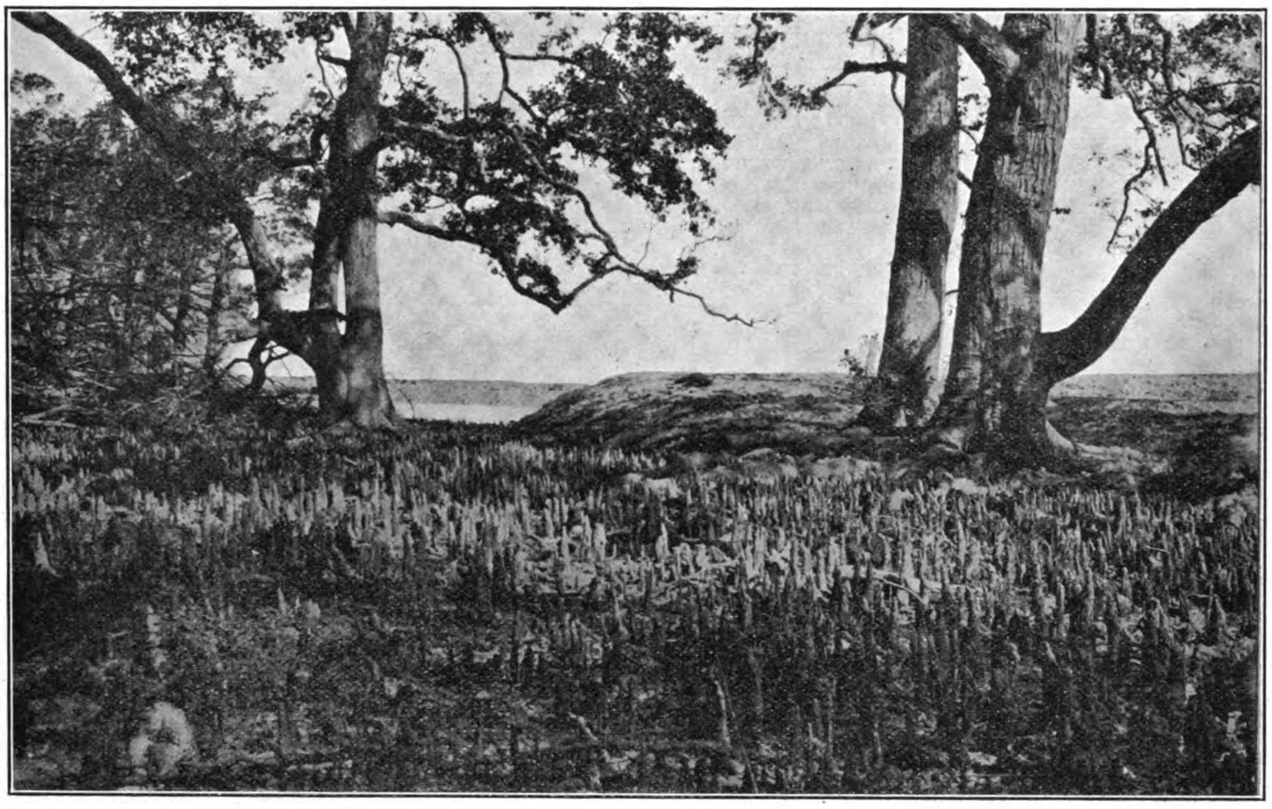
COMPRESSION ACROSS THE GRAIN.—Compression across the grain, as it usually occurs in practice, is a combination of simple compression over a given area and shearing and bending of the material along the edges of that area. It was desired, if possible, to determine just what part of the load went into simple compression and what part was used in shearing and bending the material along the edges of the area compressed. The following method was adopted and has proven very satisfactory:—

Pieces $4\times4''\times6'$ were used. The piece to be tested was laid upon the table of the machine and the load was applied to castiron blocks laid across the test piece. Two tests were made upon each piece; one with an iron block 2″ wide and one with an iron block 6″ wide, the material under the iron block being compressed 0.6″ unless it showed a decided point of failure before that deflection was reached. If no point of failure could be detected, 0.6″ deflection was assumed arbitrarily as the point of failure.

Let W equal the load necessary to apply on the 6″ block to produce a given deflection, and let W′=the load necessary to apply on the 2″ block to produce the same deflection, then W—W′=the load which would produce that deflection upon an area $4\times4''$ by simple compression—that is, without the support usually given by the material along the edges of the area over which the load is applied; therefore, $\frac{W-W'}{16}$=the stress of simple compression in pounds per square inch. This quantity will be called P.

Now, to determine the part of the load which is used in bending the material along the edges the test with the 2″ block will be considered.

The area under compression is 8 square inches; therefore, 8P=the part of the load which produces simple compression, and since W′=the total load applied, W′—8P=the part of the



PAGATPAT KNEES; TREES GROWING IN SALT WATER, ISLAND OF MINDANAO

load which bends and shears the fiber along the edges of the block, and $\frac{W'-8P}{8}$ = the stress in pounds per linear inch, which produces bending and shearing of the fibers and will be called *p*.

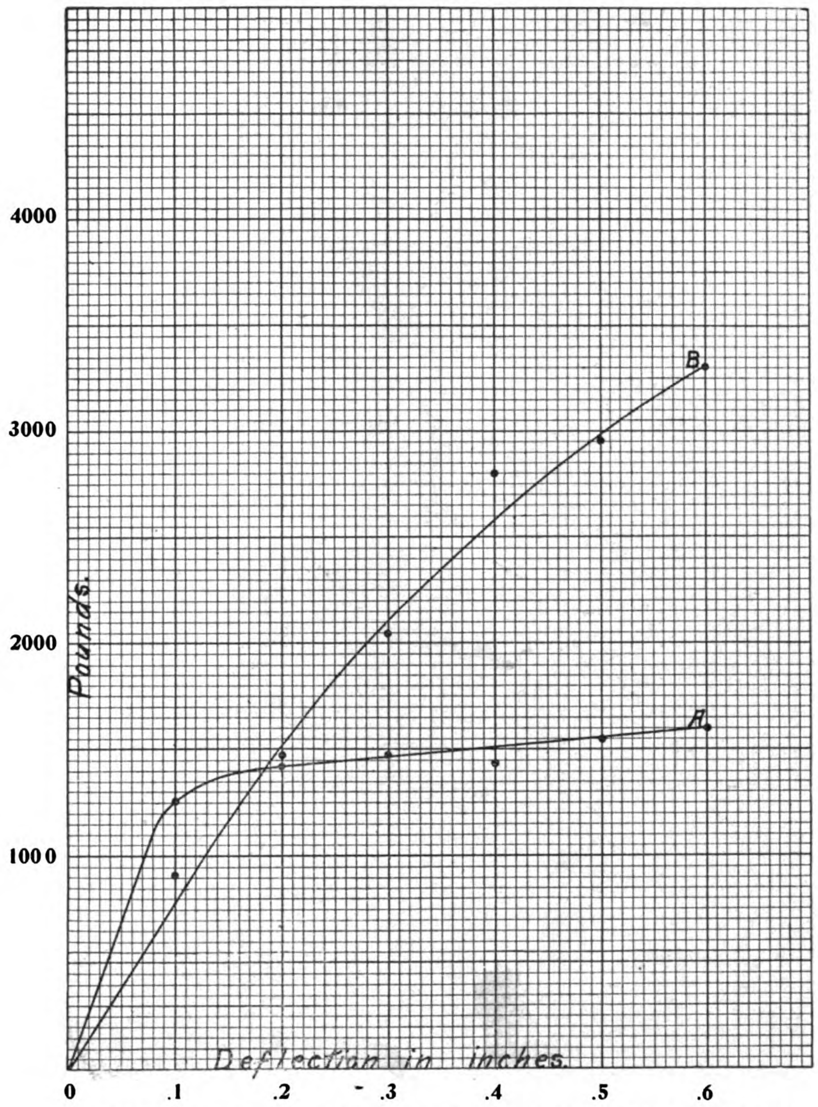
For small deflections and large areas, *p* may usually be neglected, but it increases rapidly as the deflection increases, and for large deflections and small areas which have their greater dimension extending across the grain, *p* is a very important factor, often much more important than P. P and *p* are very nearly independent of the area under consideration, and may therefore be used in all ordinary cases of compression across the grain.

In the accompanying plates of tests values of P are represented by curves A, and values of *p* by curves B. All specimens which were tested were clear and sound.

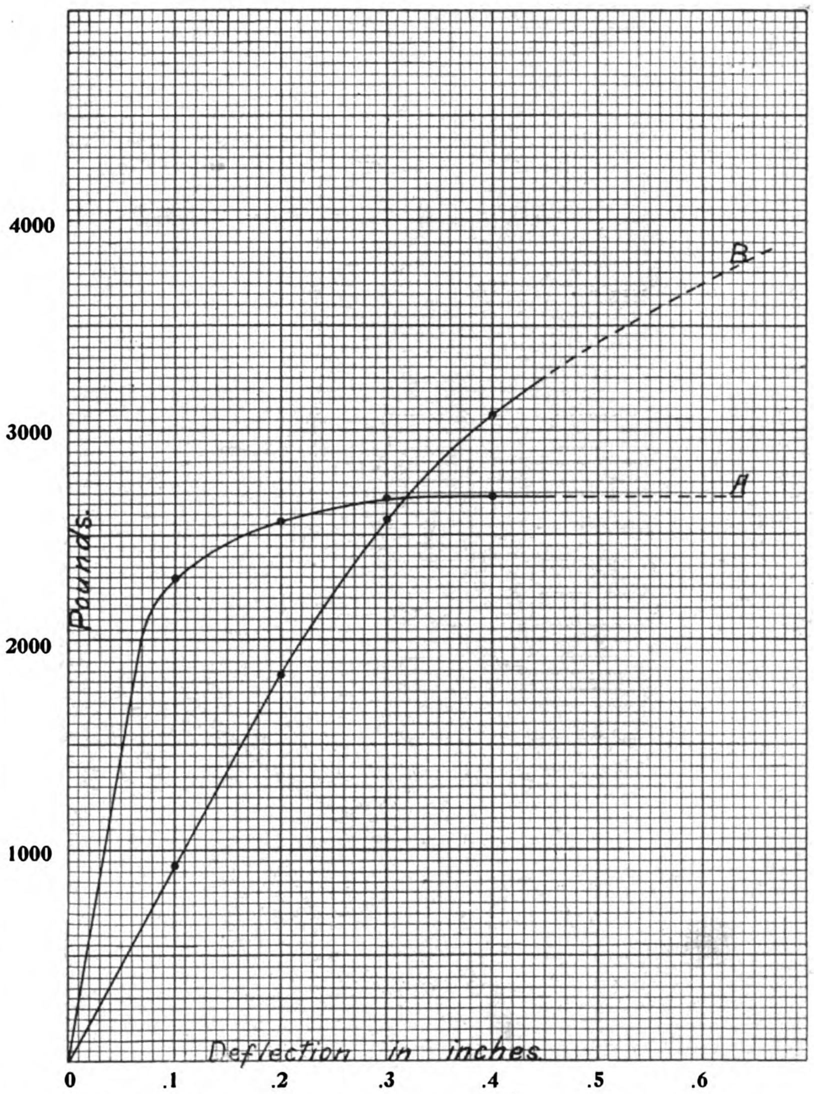
MOISTURE DETERMINATIONS.—Moisture discs were cut about ⅜″ thick. They were weighed as soon as cut and then placed in a small, steam dry kiln, having a temperature of 110° C., until they were dried to constant weight and then weighed again. The difference between the original weight and the weight after drying was considered as the weight of the moisture, and the percentage of moisture was determined with reference to the dry weight.

SPECIFIC GRAVITY.—In all cases the specific gravity was determined from the full-sized beam. After the moisture content was determined, the results were averaged to obtain the average percentage of moisture for the entire beam and the specific gravity was determined

SWAMPING DONKEY ENGINE IN NEGROS OCCIDENTAL



COMPRESSION ACROSS THE GRAIN—GUIJO GROWN IN AMBOS CAMARINES—8 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 35.4; AVERAGE SPECIFIC GRAVITY (DRY), 0.692

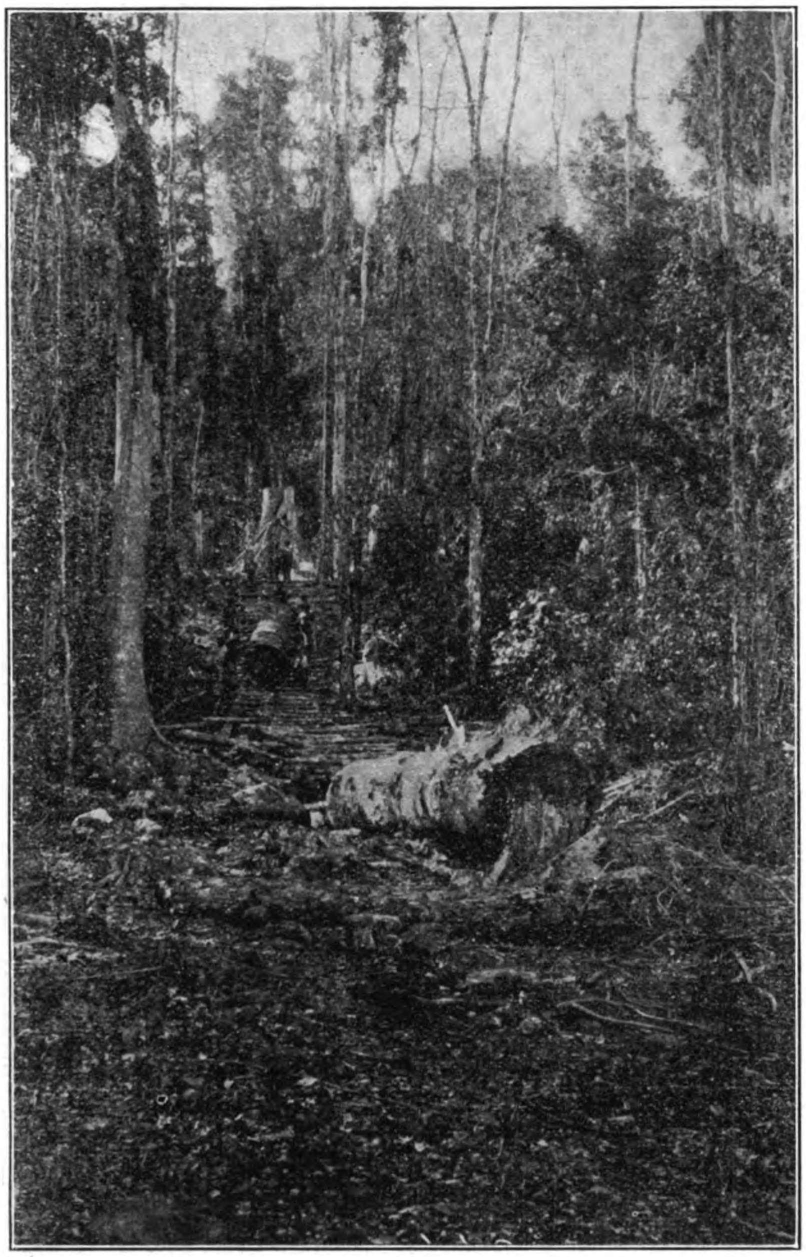


COMPRESSION ACROSS THE GRAIN—MOLAVE GROWN NEAR LAGUNA DE BAY—24 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 24.1; AVERAGE SPECIFIC GRAVITY (DRY), 0.76

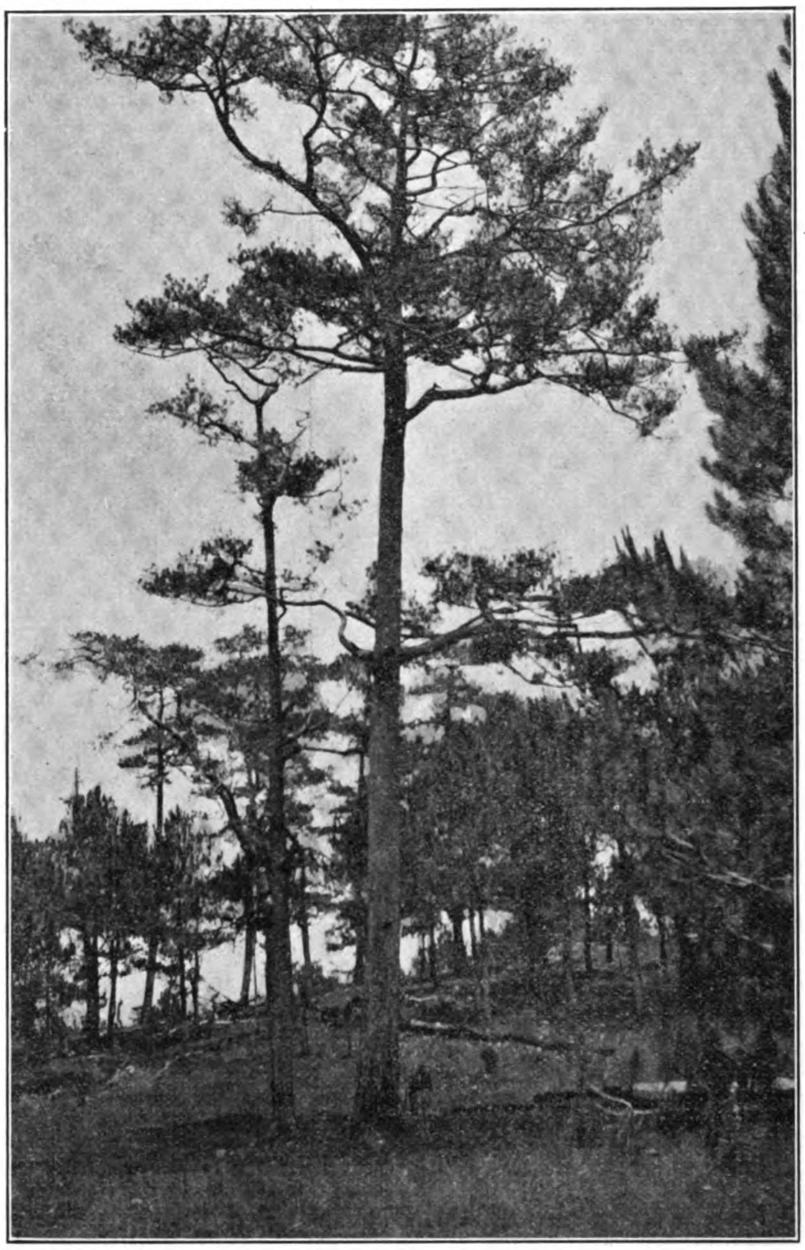
for dry wood. For these tests, the following arbitrary classification for heaviness is made: Light, less than 0.50; moderately heavy, 0.50 to 0.70; heavy, 0.70 to 0.90; very heavy, over 0.90. Thus Lauan would be classed as light; Apitong, moderately heavy; Yacal, heavy; and Ebony, very heavy.

HARDNESS.—While hardness is an important property of all materials of construction and has received considerable attention by technologists, there is great diversity of opinion as to how this property shall be defined, tested, and measured. No measure of hardness has yet been proposed which is entirely satisfactory for all materials. The woodworker says a wood is hard if it resists penetration by woodworking tools. This is probably as satisfactory a definition as can be given, and the tests made by this Bureau are based upon this conception of hardness. For lack of a better method, a scale of hardness for woods has been arranged in the following manner:—Representative samples of the various species were selected for this test. The pieces were seasoned and one surface of each was carefully smoothed. Across the grain of each smoothed surface a hardened steel point was drawn, with a pressure of 3.3 lbs. The depth of the scratch produced was considered a measure of hardness. On such woods as Ebony and Bansalaguin the steel point had very little effect, while on California Redwood and Calantas it made a ragged scratch 1-32″ or more in depth. No claim is made for great accuracy by the above method and it is possible that the order of hardness may be altered slightly if a more satisfactory test can be devised.

STRUCTURAL QUALITIES, USES AND SIZES OF PHILIPPINE TIMBER.—*Lauan.*—A light and soft wood that takes a fair polish. It is not durable in the ground or when exposed to the sun and the rain. It seasons well, is usually free from defects, and is not inclined to split or check. On a coastal plain in Mindoro the average diameter of 575 trees over 16″ of Lauan is 26″. On the lower slopes of Mount Silay, in Negros Occidental, the average diameter of 885 trees over 16″ of Almon is 28.″ The average merchantable length of 15 measured trees of this species is 88.′ The Lauan of Tayabas has a maximum diameter of 35″ and a clear length of 102′. *Apitong.*—A moderately heavy, hard wood that is fairly durable and usually clear and sound. It shrinks considerably in drying, but does not check badly. Apitong has a reddish color. It is straight but rather coarse grained. Apitong is used in ordinary construction, in shipbuilding, and for inferior furniture. On a coastal plain in Mindoro the average diameter of 73 trees over 16″ of Apitong is 26.″ In Negros the average diameter of 1,051 trees over 16″ is 24″, and the average merchantable length of 13 measured trees is 62′. The sizes given are thought to be low, for a large percentage of the Negros trees measured had been injured by tapping for resin. The Apitong of Tayabas has a maximum clear length of 100′ and a maximum diameter of 45″. On a coastal plain in Mindoro the average diameter of 161 trees over 16″ is 26″. In a similar habitat in Baler, Tayabas, the average diameter of all the trees on 31 acres 8″ and over is 21″. The maximum diameter is 53″, and the average clear length is 86′. *Guijo.*—The wood of Guijo is moderately heavy, hard, strong, brittle, fairly durable, and usually free from defects. It is inclined to warp and check in drying. Guijo has an ashy red color and is straight grained. Guijo is used in general construction and shipbuilding, for carriage wheels and shafts, for flooring and girders of houses, and for inferior furniture. On a coastal plain in Mindoro the average diameter of 168 trees over 16″ is 25″. For Baler, Tayabas, the average diameter for trees over 8″, measured on 81 acres, is 13″, the maximum diameter 35″, and the average clear length 39′. In Southern Tayabas there is a reported maximum diameter for Guijo of 40″ and a maximum clear length of 88′. *Molave.*—The wood of Molave is hard, heavy, and brittle. It is almost impervious to decay and is not attacked by the anay (white ants). It checks slightly in seasoning. Heart checks and small knots are quite frequent. The heartwood of Molave is pale yellow and the sapwood is only slightly lighter in color. The wood is very fine and usually cross-grained. The wood of Molave is most highly valued for general building purposes, where durability is essential. It is used in shipbuilding; for posts, sleepers, and interior trim of houses; and in cabinetmaking and turnery. There is a reported maximum diameter of 45″ and a maximum clear length of 24′ for Molave in Tayabas. The tree is usually irregular in shape, with heavy large branches, a part of which may be utilized. *Yacal.*—The wood of Yacal is heavy, hard, strong, elastic, and quite durable. It breaks in long splinters. Yacal has a dirty yellow color and is rather coarse but straight grained. Yacal is used in general construction and in shipbuilding, and is particularly valuable for beams on account of its stiffness and high modulus of rupture. There is a reported maximum diameter of 33″ and a maximum clear length of 52′ for Yacal from Tayabas. The tree attains sizes considerably larger than this in other provinces. One tree was measured at Santa Maria, Zamboanga, that had a diameter of 48″. *Narra.*—The wood of Narra is moderately heavy, moderately hard, very durable, and is seldom, if ever, attacked by the anay (white ant). It seasons well when properly treated and takes a fine finish. The heartwood of Narra is white, yellow, or red, and the sapwood nearly white. The grain is rather fine, but irregular, and very beautiful when quarter sawn. Narra is used principally



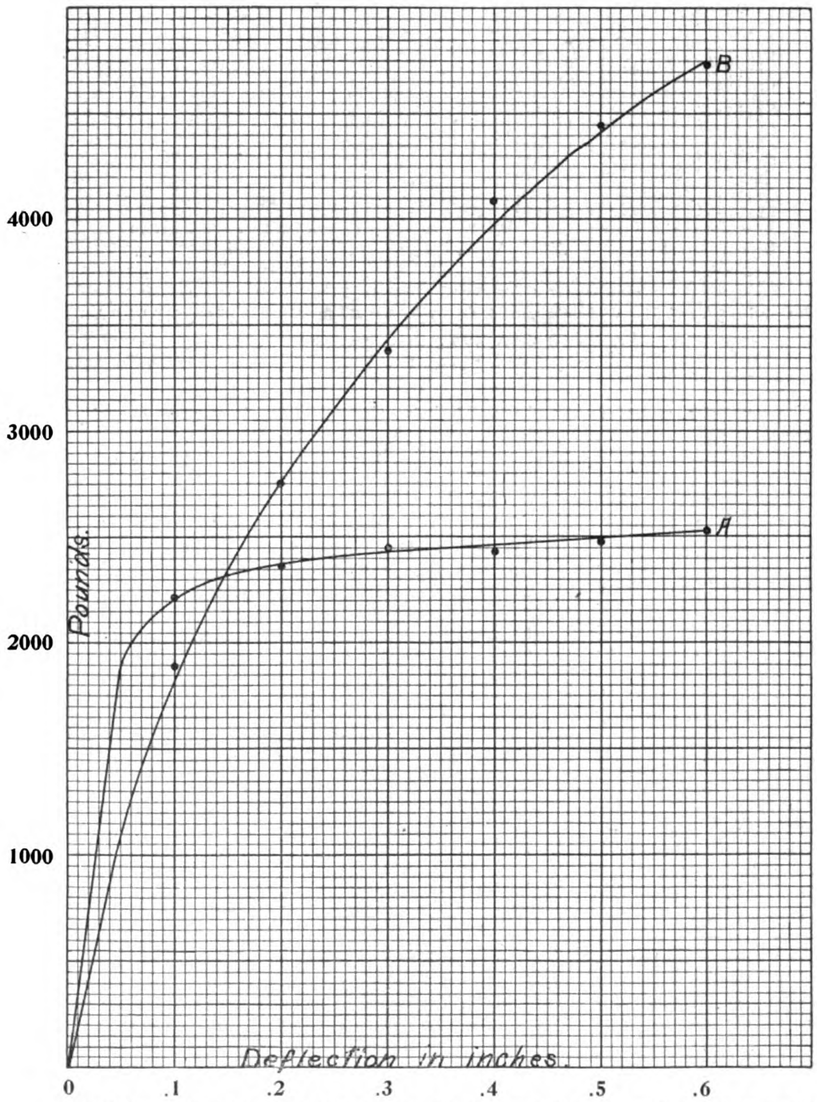
SKIDDING LOGS BY MAN-POWER, ISLAND OF MINDANAO



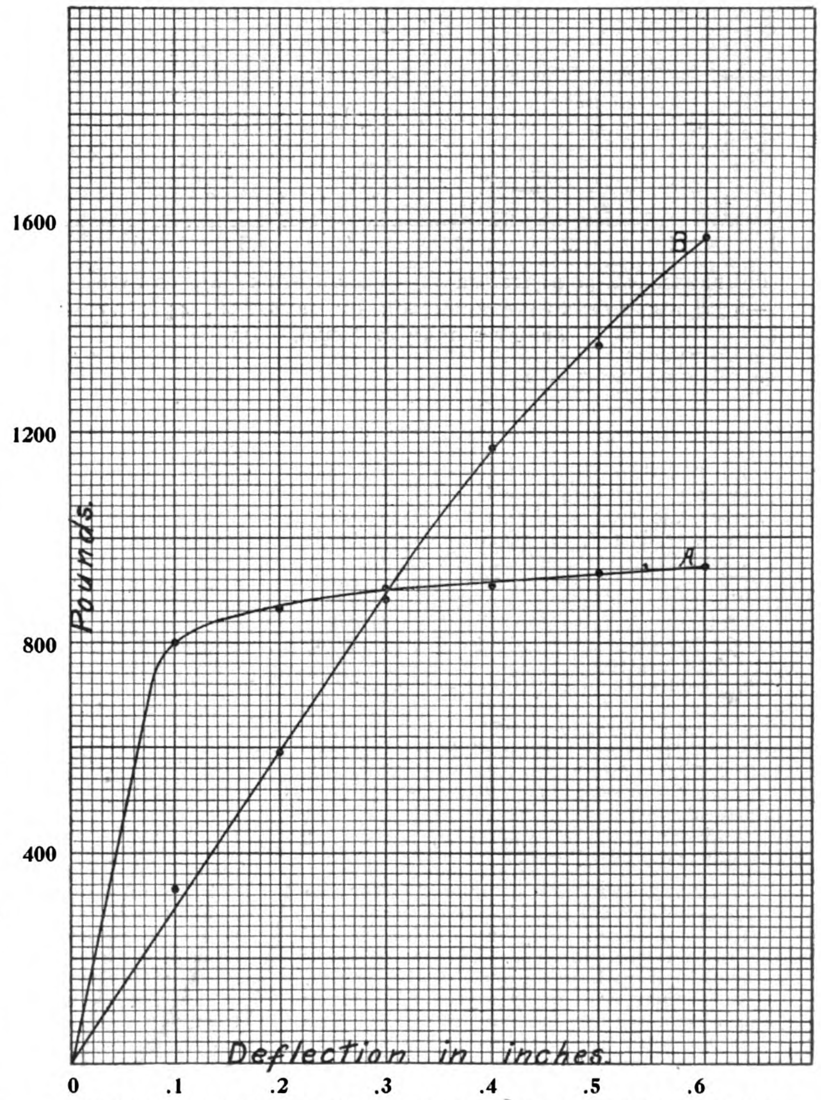
PINE TREES IN THE PROVINCE OF BENGUET, ISLAND OF LUZON

for fine furniture, cabinetmaking, and interior house trim. On a coastal plain in Mindoro the average diameter of 137 trees 16″ and over of Narra is 29″. In a similar habitat in Baler, Tayabas, the average diameter of all Narra trees 8″ and over, on 31 acres, is 25″, the maximum diameter is 50″, and the average clear length is 25′. In Southern Tayabas Narra has a recorded maximum diameter of 40″ and a maximum clear length of 40′. Narra is divided commercially into two varieties, called Red and Yellow. *Tanguile.*—A light, moderately hard structural timber that varies considerably in quality. It is not durable in the ground or when exposed to the sun and rain. The heartwood of Tanguile is frequently unsound. Tanguile is light reddish brown in color and is rather coarse grained. The wood is used in light and medium grade construction and is highly prized for small boats. See "Balacbacan" for size. *Sacat.*—A moderately heavy and moderately hard wood. It is not very durable in the ground or when exposed to sun and rain. Sacat is yellow and gray in color, and is coarse but straight grained. Sacat is used in light construction. *Ipil.*—Moderately heavy to heavy, hard, strong, almost impervious to decay, and is seldom, if ever, attacked by the anay (white ant). Ipil is light yellow to dark brown in color. The grain is usually straight. It takes a beautiful dark-brown finish. Ipil is used for general first-class construction, especially posts of houses; for sleepers, and for furniture and cabinetmaking. Sleepers made of this wood have been buried for more than 10 years without showing any signs of decay, consequently it is highly valued for railroad ties. On a coastal plain in Palawan the average diameter of 60 trees 18″ and over, is 24″, and the average clear length of 20 trees is 29′. *Dungon.*—Moderately heavy to heavy, strong, tough, durable, and very hard. It is difficult to work, is inclined to warp, and heart checks are numerous. Dungon has a chocolate-brown color and a fine, close grain. Dungon is used in first-class construction where strength and durability are essential; in naval construction, and as piles and posts. It is also valued in construction where bending by steaming is necessary, as for boat ribs. There is a recorded maximum diameter of 34″ and a clear length of 47′ for Dungon found in Tayabas Province. *Malasantol.*—Malasantol is a moderately heavy structural timber. It is moderately hard and fairly durable. Malasantol is reddish brown in color, and straight but coarse grained. Malasantol is used in general construction. *Supa.*—A good structural timber, being heavy, hard, strong, and fairly durable. It is easily worked and seasons well. Supa is yellow and brown in color and is fine grained. Supa is used in general construction, in flooring, in interior house trim, and for furniture and cabinet-making. Near Baler, Tayabas, the average diameter of all trees 8″ and over, on 81 acres, is 15″, the maximum diameter is 38″, and the clear length is 40′. *Balacat.*—Balacat is a moderately heavy, soft, inferior wood, which is not durable when exposed. This wood is white to light brown in color, and is coarse grained. Balacat is used in light or temporary construction. *Macaasin.*—Macaasin is a good structural timber, being moderately heavy, hard, strong, and fairly durable. It seasons well. Macaasin is brown in color and rather fine grained. Macaasin is used in general construction; as flooring, joists, and rafters of houses, and in cabinetwork. *Calantas.*—Moderately heavy, very soft, and not very strong, but is quite durable. It is easy to work and takes a good polish. It seasons well and is not inclined to shrink, warp, or check. Calantas has a reddish color and is fine grained. Calantas is highly valued for cigar boxes. It is also used for small boats; in furniture, cabinet and pattern making, and for carving. In Mindoro a recorded maximum diameter of 90″ and a total height of 180′ is given for Calantas. Few trees are found, however, that have a diameter of more than 60″. The boles are usually straight and cylindrical. *Tindalo.*—The wood of Tindalo is heavy, hard, stiff, strong, and durable above ground. It is prized for beams because of its high modulus of rupture. It seasons well and breaks in long splinters. Tindalo is yellowish red in color. It is fine and usually straight grained, but occasional pieces are found having the appearance of bird's-eye maple. It takes a beautiful finish. Tindalo is highly valued for fine furniture and cabinet-making. It is also used for construction purposes above ground. In Baler, Tayabas, the average diameter of all trees 8″ and over, on 81 acres, is 12″ and the maximum diameter is

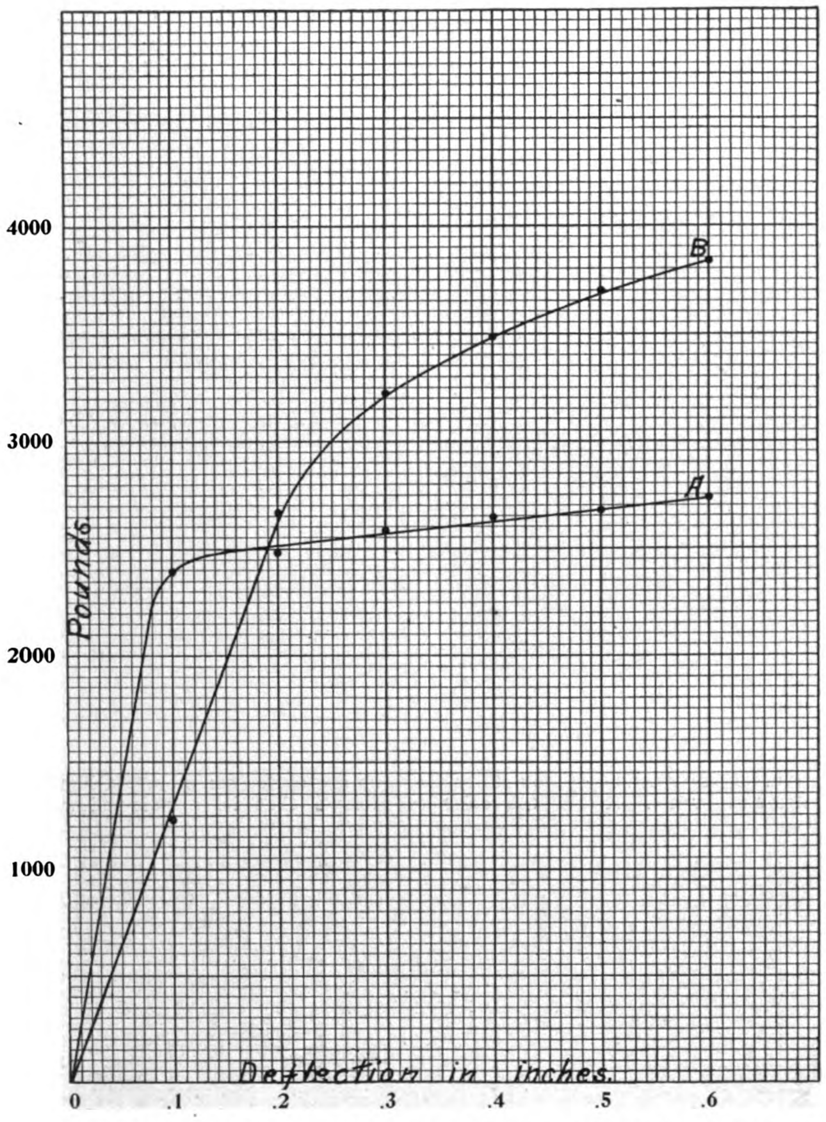
24″. The tree attains much larger sizes in other provinces. *Amuguis.*—Amuguis is a structural wood of medium quality, being fairly strong, brittle, moderately heavy and hard. Amuguis is reddish brown in color and is rather fine grained. Amuguis is used in ordinary construction and in cabinetwork. On a coastal plain in Mindoro the average diameter of 185 trees 16″ and over is 25″, and the average clear length of 10 trees is 33′. In Baler, Tayabas, the average diameter of all trees of Amuguis, on 81 acres, 8″ and over is 13″ and the maximum diameter is 31″. *Acle.*—The wood of Acle is moderately heavy and hard, quite durable, and seasons well. This is one of the most beautiful Philippine woods. It has a rich dark-brown color and is fine grained. It resembles English walnut and is usually given a walnut finish. When plain sawn it presents a large irregular figure, but when quarter sawn the grain appears finer. Acle is highly valued for fine furniture and cabinetmaking. Plain sawn lumber is preferable for large surfaces and quarter sawn for small surfaces and panels. This wood is considered as good as walnut for gunstocks, but has not yet been used commercially for that purpose. Acle is a tree with a short irregular bole. *Betis.*—A high-grade structural timber, being very hard, heavy, strong, and durable. It lasts well in the ground and is fairly resistant against the attack of sea worms (*teredo*). Betis is a light-brown to purplish color and is very fine grained. Betis is used in general high-grade construction, where strength and durability are essential. It is used in shipbuilding and for piles and posts. *Bansalaguin.*—A valuable structural timber, being very hard, heavy, strong, brittle, and durable. Large sizes of it check somewhat in seasoning and it is hard to saw. Bansalaguin has a dull reddish color and is very fine grained. Bansalaguin is a first-class construction timber and is used for posts, for shipbuilding, as tool handles, and in turnery. *Palo Maria.*—A good construction timber; is hard, moderately heavy, and fairly strong and durable. It is inclined to warp slightly. Palo Maria has a reddish color, is fine grained, and takes a beautiful finish. It has an irregular figure, which is caused by part of the fibers running perpendicular to the surface. Palo Maria is used in general construction, for masts, and for hubs and turnery. It is very valuable for fine furniture. *Batitinan.*—A structural timber of good quality, being hard, durable, and heavy. Batitinan is light yellow to olive green in color and has a fine and straight grain. Batitinan is used in general construction and for posts and sleepers. *Aranga.*—Very hard, heavy, strong, and durable. It is one of the most valuable woods in sea water, for it withstands well the action of the sea worm (*teredo*). It is usually clear and sound and seasons without difficulty. Aranga is light yellow in color and fine grained. Aranga is used as piling and in construction in sea water almost exclusively. It is, however, a very valuable timber for high-grade construction. *Banuyo.*—Moderately heavy and moderately hard, but is not very strong. It is easily worked. The wood of Banuyo is golden brown in color and has a fine grain similar to that of Acle. It is often finished in its natural color and sometimes stained a dark brown and given an Acle finish. Banuyo is used in making fine furniture and in cabinetwork. Its beauty is only beginning to be appreciated. It is used to some extent in light construction. *Balacbacan.*—Moderately heavy, very soft, and brittle. It seasons well and is easily worked. Balacbacan is reddish brown in color and coarse grained. Balacbacan is used in light or temporary construction and for inferior cabinetwork. In the Island of Negros the average diameter of 620 trees 16″ and over is 27″, and the average merchantable length of 6 trees is 69′. In the same stand, for the tree known as Mangachapuy (see below) measurement of 1,142 trees 16″ and over shows the average diameter to be 34″, and the merchantable length (average of 23 trees) is 72′. *Mayapis.*—A light, soft wood and is not durable. Mayapis is white and gray in color and coarse grained. Mayapis is used in light or temporary construction. In Baler, Tayabas, measurements of all trees 8″ and over in diameter, on 31 acres, show that Mayapis has an average diameter of 26″, a maximum diameter of 75″, and an average merchantable length of 68′. *Malugay*—The most important property of Malugay is toughness, a quality quite uncommon among Philippine woods. It bends well when steamed, is fairly strong and stiff, and has long fibers. It is moderately heavy and moderately hard, but easily worked. It is usually free from defects and shrinks considerably while seasoning, but does not check badly. Malugay ranges in color from reddish to white and is fine grained. Malugay is used for ribs and planking for small boats; in interior trim; for carbinetwork, and for general construction. This wood has only recently been introduced into the Manila market and at present is not used extensively. It is an excellent wood in many respects and will undoubtedly come into greater favor. *Sasalit*—A very hard, heavy, close-grained, and durable wood. Small knots and checks are quite common. It has the color of Molave—that is, a pale-yellow



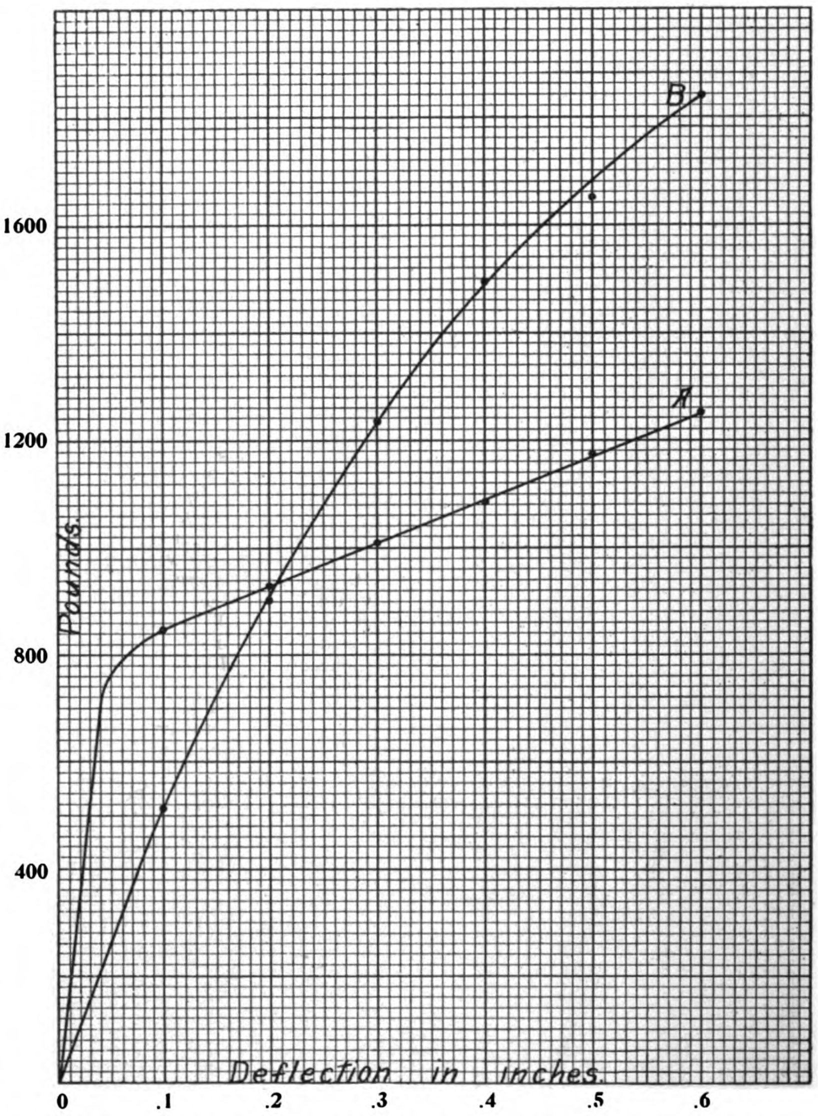
COMPRESSION ACROSS THE GRAIN—YACAL GROWN IN AMBOS CAMARINES—10 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 28.6; AVERAGE SPECIFIC GRAVITY (DRY), 0.85



COMPRESSION ACROSS THE GRAIN—TANGUILE; LOCALITY UNKNOWN—7 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 36.7; AVERAGE SPECIFIC GRAVITY (DRY), 0.531



COMPRESSION ACROSS THE GRAIN—IPIL GROWN IN AMBOS CAMARINES—6 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 43.6; AVERAGE SPECIFIC GRAVITY (DRY), 0.755



COMPRESSION ACROSS THE GRAIN—DUNGON GROWN IN AMBOS CAMARINES—9 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 25 TO 35; AVERAGE SPECIFIC GRAVITY, NOT DETERMINED

color—and is fine grained. Sasalit is used for posts, general house construction, and is considered as good as Molave for these purposes. In the Island of Negros the average diameter of 173 trees 12″ and over is 15″. In Baler, Tayabas, the average of all trees 8″ and over, on 81 acres, is 12″, the maximum diameter is 38″, and the clear length is 33′. *Liusin.*—A very hard, heavy, strong, and durable wood. It withstands well the action of the sea worm (*teredo*). Liusin is white and reddish in color, and is fine grained. Liusin is used in piling, for wharf construction, and for shipbuilding. It is considered one of the best woods for construction exposed to sea water. *Lumbayao.*—A soft and moderately heavy wood of medium quality. It seasons well and is usually free from defects. Lumbayao has a reddish-brown color and is coarse grained. Lumbayao is used in general construction. This wood is marketed in Zamboanga, Iloilo, and Cebu, but is not brought to Manila.

PHILIPPINE SAWMILLS, LUMBER MARKET AND PRICES.—Manila is the principal lumber market of the Philippines. Here are located five of the most important mills. Timber is being shipped to them from all parts of the Islands. Three of these mills are equipped with heavy band saws and other modern machinery. The other mills are equipped with vertical gang and circular saws. The combined sawing capacity of the five mills is about 100,000 board feet per day. One mill has a capacity of 30,000 board feet, two of 20,000 board feet, and two of 15,000 board feet per day.

During the early operations of the mills in Manila, they had to contend with numerous difficulties; Filipino labor was unreliable; many of the hardwoods were difficult to saw and it was impossible to secure a sufficient supply of logs from the provinces with regularity. Conditions have improved, however, during the past two years, and the mills are now operating in a very satisfactory manner. They now saw all commercial woods without difficulty and are depending more and more upon their own cuttings to supply logs to meet their requirements. With proper training, Filipinos are found to be apt in handling machinery. Two of the mills have recently been running at night to fill orders.

Some confusion exists in the market regarding the identity of a few of the leading commercial woods. This is especially true of Lauan. At least six different woods are now being marketed under that name. From the commercial standpoint this is not important, however, as all of these woods resemble the true Lauan (*Shorea contorta*) closely and are of about the same quality. There are several different kinds of wood being sold for Apitong, and occasionally Apitong is sold for Guijo. Lauan, Apitong, and Guijo are used to a larger extent than any other fifteen native woods.

Logs are bought and sold by the Spanish cubic foot. One Spanish cubic foot equals 0.765 of an English cubic foot. Lumber is bought and sold by the thousand English board feet.

In sawing the average-sized logs that are brought into the market, between 5 and 6½ board feet are obtained from 1 Spanish cubic foot, but in the large-sized logs sometimes as high as 8 board feet are cut from 1 Spanish cubic foot.

Until quite recently it has been practically impossible to obtain well-seasoned lumber in the market. The mills have been accustomed to sawing to order, consequently lumber was seldom in the yards a sufficient length of time to become seasoned. There were no facilities for kiln drying lumber in large quantities. Two small kilns were erected several years ago, but they were of small capacity and have not been used extensively. One of the leading mills has recently installed a kiln of about 50,000 board feet capacity which is operating very satisfactorily. This kiln is capable of drying 100,000 board feet or more of native lumber per month, the amount depending upon the texture and thickness of the lumber. This concern is now using kiln-dried native lumber in its cabinet factory and is preparing to kiln dry Oregon Pine and California Redwood for use in its planing mill.

A considerable amount of imported lumber is still used in the Islands. Most of this is Oregon Pine and California Redwood. During the period from July 1st, 1904, to June 30th, 1905, 29,679,644 board feet of lumber and timber, and 9,261 pieces of timber (dimensions not known) were imported. During the same period, 139,148.77 cubic meters of native timber were cut. If this were all sawn into lumber, it would make about 40,000,000 board feet.

The price of logs fluctuates from day to day. The following table gives the Manila market prices:—

Manila Market Prices.

[Philippine currency; ₱2=$1 gold.]

Kind of wood.	Logs per Spanish cubic foot.	Sawing per 1,000 English board feet.	Lumber per 1,000 English board feet.
Lauan	₱ 0.30-0.35	₱ 13.00-15.00	₱ 70.00- 90 00
Apitong	.35- .37	16 00-18.00	90.00-115.00
Guijo	.50- .65	16.00-18 00	98.00-140.00
Molave	.80- .90	21.00-23.00	215 00-300.00
Yacal	.65-1 00	21 00-23 00	160.00-200 00
Yellow Narra	.70- .80	16.00-23 00	225 00-275.00
Red Narra	.75-1 00	16. 0-23.00	250 00-300.00
Tanguile	.33- .45	13 00-18 00	95.00-120 00
Sacat	.40- .75	15.00-18.00	100.00 150.00
Ipil	.76- .85	21 00-23.00	180.00-225.00
Dungon	.80- .90	38.00 40 00	220 00-300.00
Supa	.65- .70	21.00-23.00	140 00-220.00
Balacat	.40	18.00	100.00
Macaasin	.40- .75	15.00-18.00	110.00-150 00
Calantas	.65-1.20	13.00-15.00	180.00-200 00
Tindalo	.78-1.00	21 00-23.00	250 00-300.00
Amuguis	.40- .75	18 00-21.00	110.00 150.00
Acle	.85-1.20	16.00-23 00	280 00-350.00
Betis	.70-1.00	38.00-40 00	250 00-300 00
Bansalaguin	.45- .85	23.00	150 00-260 00
Palo Maria	.75- .80	18.00	175.00-185.00
Batitinan	.65- .75	21.00-23.00	150 00-280 00
Aranga	.50- .75	21.00-23.00	150 00-160.00
Banuyo	.55- .75	16.00-18.00	140 00-220.00
Malugay	.60- .65	16.00-23.00	95,00-130 00
Balacbacan	.35	13.00-18.00	70.00- 90 00
Mayapis	.35	15.00	90 00

Aside from the logging which is carried on to supply the Manila mills, there is some logging in connection with mills located in the provinces.

The operations of one company in Negros Occidental are probably more extensive than those of any other company in the provinces. Their mill has a capacity of about 20,000 board feet per day, but the daily cut is less than 10,000 board feet. The trees known by the Visayan names of Balacbacan, Mangachapuy, and Almon are being cut principally; the first two are sold in Iloilo and Manila as Red Lauan or Balacbacan. Almon has the market name of White Lauan. This company has recently purchased a narrow-gauge railway for use in logging and contemplates putting in a new mill, with a much larger capacity, in the near future. Another company has a mill located on the Island of Basilan, which is cutting about 6,000 board feet lumber per day. This lumber is marketed in Zamboanga, Iloilo, and Cebu. The Zamboanga prices quoted by this company are as follows:—

	Per 1,000 board feet.
Lumbayao	₱72.00
Guijo	80.00
Calantas	80.00
Yacal	140 00
Camagon	300 00
Tindalo	180 00
Ipil	180 00
Lauan	50.00
Narra	200.00

Planing, ₱7 extra per 1,000 board feet.

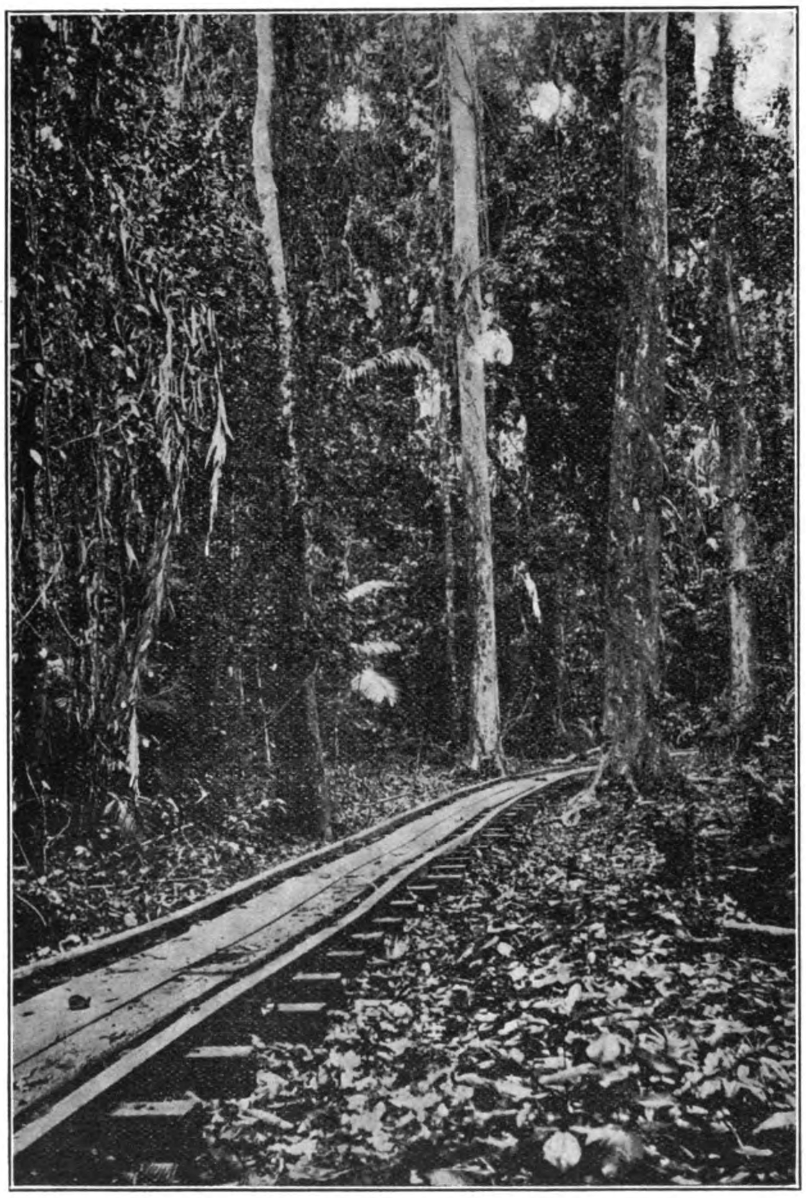
Another company, a branch of a Manila milling company, has recently installed in Mindoro a circular-saw mill, with a capacity of 5,000 to 10,000 board feet per day. In the near future this company will have the mill operating at full capacity and will ship lumber to Manila.

Near Baguio, Benguet, there is a mill for sawing Benguet pine, which sells in Baguio and vicinity for ₱85 to ₱95 per 1,000 board feet. The maximum capacity of the mill is 3,000 board feet per day, and the average daily cut is 2,000 board feet. In the near future, this company will have a new sawmill in operation in the same locality.

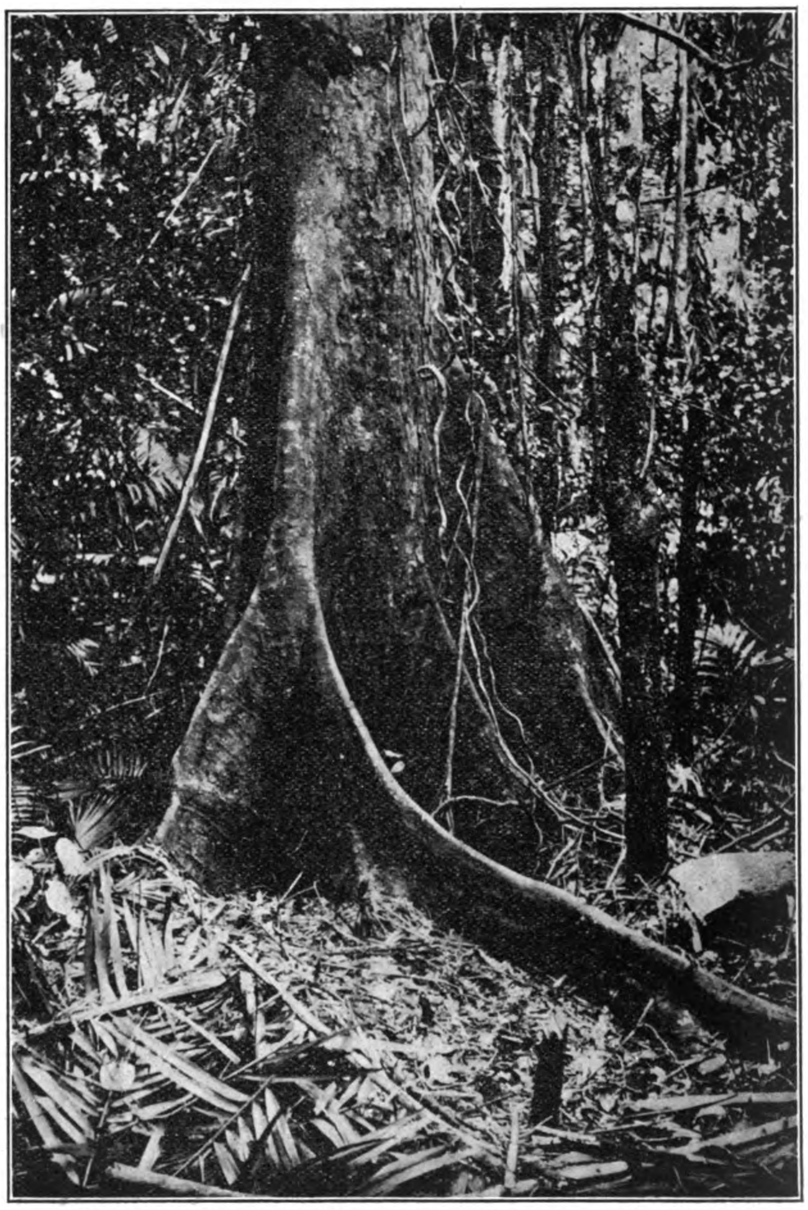
A small mill has recently been installed at Gattaran, Cagayan, which supplies Aparri and the towns up the Cagayan River with lumber. This mill charges ₱0.80 per English cubic foot for first-group timber in the log, and ₱20 per 1,000 board feet for sawing.

About 2,500 board feet per day is the capacity of a mill which is cutting Agoho (*Casuarina equisetifolia* Forst.) almost exclusively at San Antonio, in the Province of Tarlac. This is put on the market at Manila for ₱100 per 1,000 board feet.

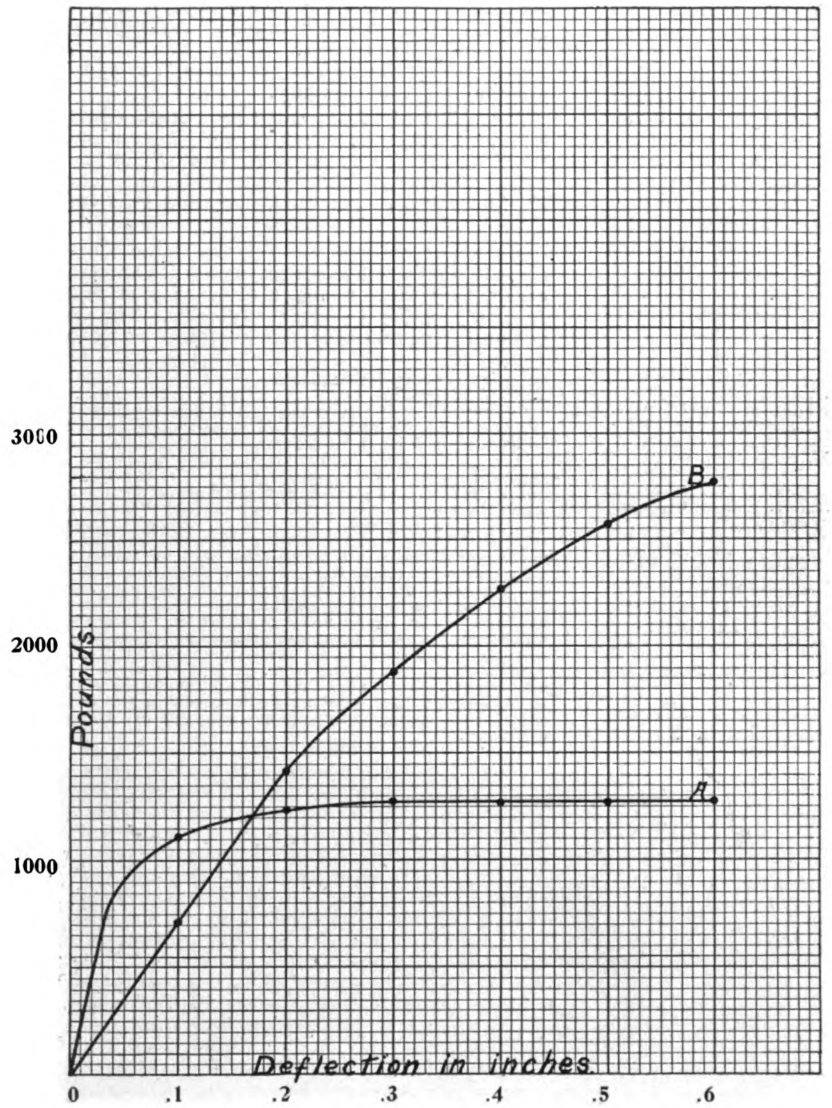
Shanghai-Nankin Railway.—It is now confidently expected that the Shanghai and Nankin Railway will be completed through to the latter city before the end of the current year. According to the original plans the railroad will not enter the City of Nankin itself, but is to have one station just outside the northeast city gate and another on the bank between Hsia-kuan and the mouth of the Nankin cut off. There is some talk of a tramway from the river station, which will pass through Hsia-kuan, follow the city wall on the outside, and end at the Han-hsi Gate. This line would be principally for the conveyance of passengers to and from the railway station and river steamer landings, but it would not enter the city. While the Chinese are certainly progressing and changing in many ways they still stick to some old customs and observances which, to say the least, cause them much inconvenience. They seem to have an innate dread of permitting any new opening to be made in the city walls, and consequently neither railways nor trams can enter.



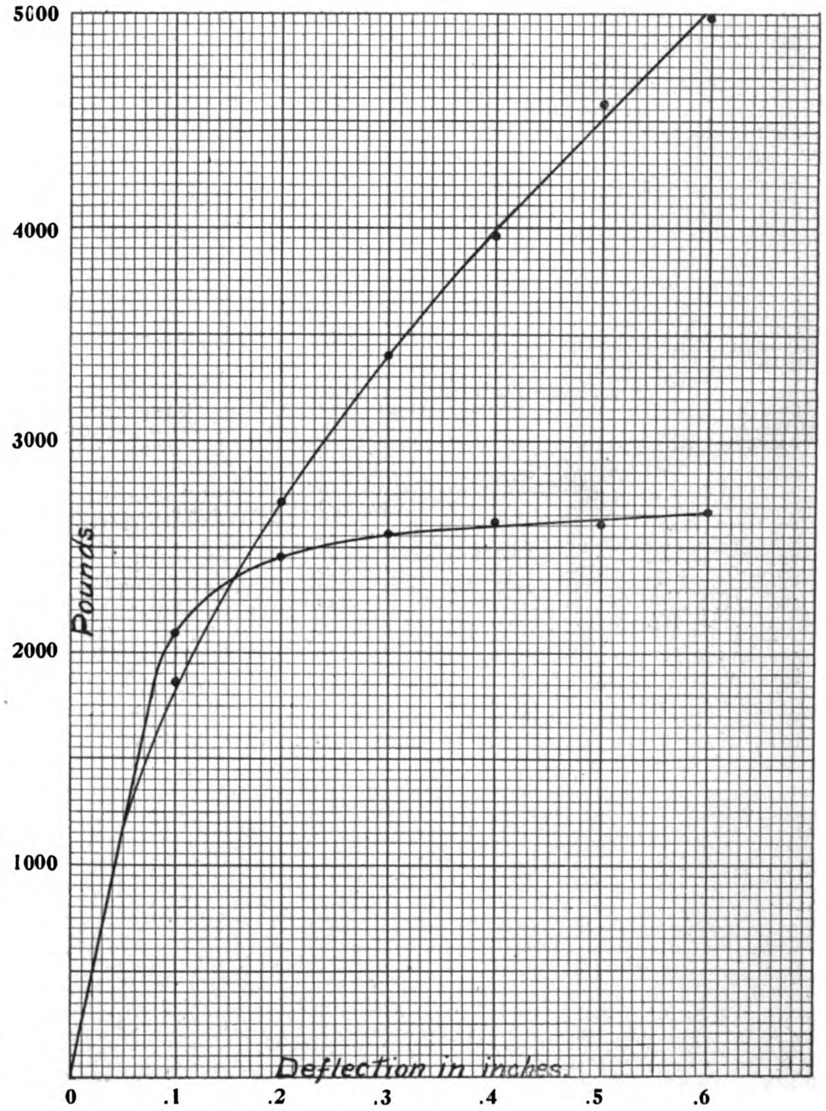
FOREST OF HAGACHAC, ISLAND OF MINDORO, SHOWING A FORESTRY RAILROAD



GUIJO, EAST COAST OF MINDORO; DIAMETER 112 CENTIMETERS ABOVE BUTTRESS (3 METERS)



COMPRESSION ACROSS THE GRAIN—AMUGUIS GROWNIN MINDORO—10 TESTS; AVERAGE PERCENTAGE OF MOISTURE, 5.19; AVERAGE SPECIFIC GRAVITY), 0.681



COMPRESSION ACROSS THE GRAIN—ARANGA GROWN IN AMBOS CAMARINES—8 TESTS; AVERAGE PERCENTAGE OF MOISTURE. 25.6; AVERAGE SPECIFIC GRAVITY (DRY), 0 806

BIG SUGAR MILL FOR JAPAN

Judging from all present indications, says a Honolulu exchange of December 15th, the Honolulu Iron Works is about to score another triumph in the Far East; only this time it will probably be a greater one than before. Manager Carl Hedemann of the Iron Works has left for Japan in connection with this matter.

For some time past, the Iron Works has been in correspondence with a large Japanese company, which has extensive sugar interests on the Island of Formosa. This concern intends to erect a big mill, and the Iron Works some time ago sent over its estimates on the matter. A couple of days ago a hurry call was sent from the company asking that Manager Hedemann come to Japan as soon as possible. This indicates that the Japanese have decided to have the Iron Works take the contract for erecting their mill, and that they want to close the deal and get the work started as soon as possible.

The mill which this company intends to build will be a very large one, of about the same size as that at Waialua. The Iron Works has already built one mill in Formosa, but that was a smaller affair, of about the size of that of the Waiakea Mill Company, near Hilo.

Besides the matter referred to above, the Iron Works have for some time past been negotiating with a large sugar refining company, also in Japan, which also intends establishing a large plant. This affair will also be attended to by Hedemann while he is in Japan. Although the Iron Works is at present having an extremely busy season, and the absence of Superintendent Dyer made the staff short handed, the matters mentioned were considered to be of considerable importance and to warrant Hedemann making the journey. He will be absent only a comparatively short time expecting to return in the middle of January.

The success which the Honolulu Iron Works is meeting in placing its plants in the Far East as well as elsewhere, can be nothing but extremely flattering. Furthermore, it is of no mean importance to the community at large, as the making of these enormous quantities of machinery means a good bit of money in the pockets of the laboring man.

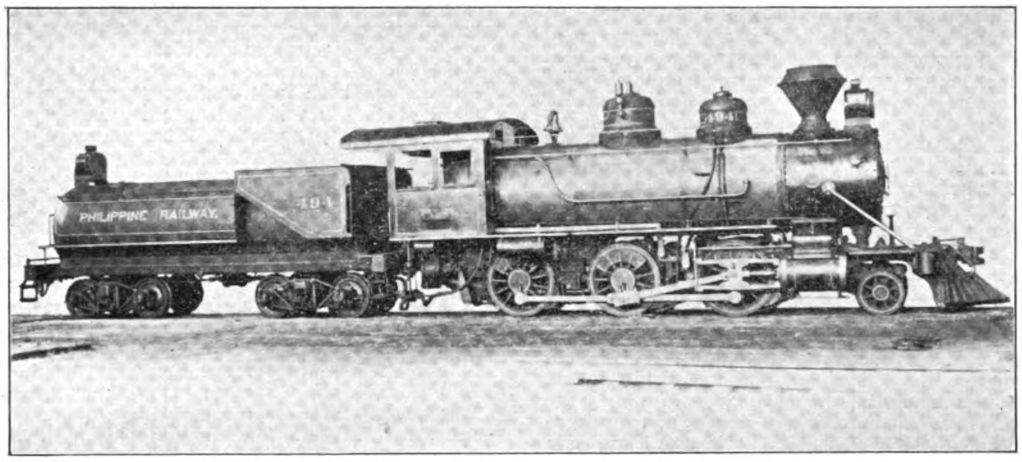
While it is considered that the presence of so many Japanese in this country, not a few of whom are well able to judge about mills and sugar machinery, may have something to do with the success which the Iron Works has met in Japan, it is also an assured fact that the intrinsic merits of the machinery turned out by that concern is the main cause thereof, as the Japanese sugar men have solicited bids and estimates not only from the mainland but also from Europe, and it has been after a comparison with these that Honolulu has carried off the prize as being able to do the most satisfactory work.

SINGAPORE AND KRANJI RAILWAY

The total earnings in 1905, showed increase of $7,486 over 1904. An increase of 23,225 passengers and 24,324 piculs of goods over 1904 is shown in 1905. On season tickets there is an increase of 90. One early and one late train have been added to the service for the convenience of season ticket-holders and others. These trains do not pay but they will be given a fair trial before they are withdrawn. Considering that the railway has been open more than three years, there has been very little building in Bukit Timah Road and adjacent localities. The capital account to December 31st, 1905, was $1,933,510.36. The net earnings for the year were $68,744.38, equal to a dividend of 3.56 per cent. The total revenue from all sources amounted to $203,031.40. The net earnings per train mile were 63 cents. The working expenses for the year amounted to $134,287.02. The proportion of working expenses to gross receipts was 66.14 per cent. No heavy repairs were charged to revenue during 1905. There was a great deal of trouble with all the locomotive boilers and all of them have been overhauled. They were all pitted more or less and the cause is put down to the water, but the matter is not yet satisfactorily settled. One bogie first-class, one bogie second-class and one bogie compo brake van were added to the rolling stock, and 31 carriages and wagons were repaired and painted during the year. There were three engine failures and six cases of hot axles during the year. The two ferry-steamers have worked satisfactorily but considerable repairs were necessary to one of the boilers. Ferry mileage 7,832; engine mileage 113,726. There was only one derailment during the year, that of a goods truck in Singapore Yard.

PHILIPPINE RAILWAY ROLLING STOCK

A consignment of four mogul locomotives and several 30-ton Rodger ballast cars, for construction work on the new railways on the Islands of Panay, Cebu and Negros, Philippine Archipelago, has been unloaded from a ship at Iloilo. This rolling stock came from the United States as a part of a cargo of railroad materials, and is being set up for use as required. The locomotives are somewhat heavier than the nature of the work they will be called upon to do demands and the future orders for engines will call for lighter types. All of the rolling stock now on the ground was ordered by Messrs. J. G. White & Co., Inc., of New York, the engineering contractors for the Philippine Railway Company.



MOGUL LOCOMOTIVE FOR THE PHILIPPINE RAILWAY

The mogul (2-6-0) locomotives were built by the Baldwin Locomotive Works, Philadelphia. They are narrow gauge (3′ 6″). The cylinders are 17×26″, driving wheels 50″, and with a working steam pressure of 180 lbs. per square inch the tractive power effort of the engine is 21,000 lbs. The driving-wheel base is 12′ and the total wheel base of the engine is 19′ 4″. The weight on drivers is 84,000 lbs., and the total weight of engine and tender ready for service 183,000 lbs. The boiler is 60″ in diameter, with a total heating surface of 1,322 square feet. The grate area is 19 square feet, giving a ratio of heating surface to grate area of 69. The engine and tender are fitted with Westinghouse airbrakes and M. C. B. automatic couplers, and they are arranged to work on curves of from 15 to 20 degrees. The valves are the Richardson balanced type and are operated by the regular Stephenson link motion. The grate and stack are designed to burn Philippine lignite coal. A sample of the coal from the Caridad mines on the Island of Cebu gave the following analysis:—Fixed carbon, 54 per cent; volatile matter, 35 per cent; moisture, 9 per cent; ash, 2 per cent. The stack used for this fuel is somewhat similar to the old diamond stack which was used so successfully with the lignites west of the Missouri River, in the United States. The analysis shows that the Philippine lignite is of a superior grade, as it has such a large proportion of fixed carbon. Ordinary lignites have much less than 50 per cent fixed carbon and the Philippine lignite must be classed as low-grade bituminous coal. A very efficient spark arrester is necessary on account of the numerous villages along the lines, as the native houses are for the most part built of the highly inflammable bamboo and nipa.

These locomotives are intended primarily for mixed passenger and freight traffic, and it is estimated that they will haul a gross load of 500 tons up a straight grade of 1½ per cent. The principal dimensions are given in tabulated form below:—

Gauge	3′ 6″
Weight (total)	98,000 lbs.
Weight on drivers (approximate)	84,000 lbs.
Diameter of drivers	50″
Cylinders	17×24
Boiler (diameter)	62″
Boiler (number of tubes)	220
Boiler (diameter of tubes)	2″
Boiler (length of tubes)	10′ 6¼″
Firebox (length)	95″
Firebox (width)	29″
Grate (area)	19.13 sq. ft.

Tender.

Tank (type)	Vanderbilt cylindrical.
Capacity (water)	40,000 galls.
Capacity (coal)	8 tons.
Wheels (diameter)	33″

Ballast Cars.—The ballast cars were built by the American Car and Equipment Company, Chicago, at its Michigan Department Works, Detroit. Their equipment conforms to the specifications and it is believed will be in every way satisfactory, the journal boxes of malleable iron corresponding to the M. C. B. standards in general dimensions. The axles are of steel and underwent a thorough physical and chemical test at the works of the Carnegie Steel Company, which showed them to be satisfactory and suitable for the purposes intended. The castiron wheels were made of particularly good material, the weight of each being 500 lbs. They were forced on axles at pressures varying between 30 and 45 tons. The brakeheads and shoes correspond to the M. C. B. standards, and the airbrake and its details are well designed and conform to the M. C. B. proportions. The braking power is 16,000 lbs. The weight of the car empty is 24,600 lbs., which gives a braking power of about 65 per cent of the light weight. There is ample clearance for passing curves of 20 degrees, and the height of the coupler is 34″ from the rail. Grabirons and steps are located in accordance with the legal requirements in America, and the airbrake hose is of the Peerless Perfected make. The clearance width of the car is less than 9′. The brake cylinders are 6×8″ and the travel of the brake piston with the car standing in the shops was 4″. The cars are of the convertible type and can be worked with or without the sides and hopper, the doors of which latter are operated by means of levers at the end of the car. The illustration herewith shows the car with the side attachments. In this connection it might be noted that the spelling of the word *Philippine* has been corrected. These cars are said to be the best and most convenient for construction purposes manufactured in the United States.

30-TON RODGER BALLAST CAR FOR THE PHILIPPINE RAILWAY

CHINESE LIGHTHOUSE SERVICE

The extension of the Chinese lighthouse service is noted by a Shanghai correspondent of the London *Times*.

Among the many and great services rendered to China by the Imperial Maritime Customs Administration, not the least has been the provision of a first-class system of lights and other aids to navigation on the coast and navigable rivers from Hainan and Formosa in the south to Newchwang in the north. The list of the new lights in hand or projected for immediate execution is as follows:—A sixth-order light for a rock near the Bogue Forts, Canton River; a large steel gaslighted lightship for the Yangtsze; a fourth-order group-flashing light for Tungting Island (Chusan Islands); a first-order group-flashing light on Chelang Point, and two fourth-order group-flashing lights and one fourth-order occulting light for the channel between Fuchau and Wenchau. The coast and rivers in China are divided into 17 districts, in each of which the lights are officially under the local commissioner of customs. The Shanghai and Ningpo districts are controlled by the coast inspector's office at Shanghai; south of Ningpo by an inspector stationed at Amoy; while Shan-tung and the Gulf of Pechili are worked from Chifu and Tientsin. Inspection and victualing work are done by steam tenders and by the revenue cruiser fleet. Sites for new lights are chosen by the engineer in chief and coast inspector in consultation, and the estimate submitted to the inspector-general. Local expenditure is defrayed by the commissioner of the port concerned, while contracts for lanterns, etc., required from abroad are put up for tender in London by the customs secretary residing there. Most of the lanterns and optical apparatus have been supplied by Birmingham and Paris firms. There are practically no fixed lights on the coast. All the new revolving lights are floated on mercury and provided with incandescent petroleum burners.

REDWOOD RAILWAY TIES

In a letter to the California-Manila Lumber Commercial Company, of Manila, which imports extensively California redwood, the Superintendent of Construction for Messrs. J. G. White & Co., Inc., at Manila, gives testimony as to the merits of redwood for railway ties or sleepers. Writing for the Superintendent of Construction, under date of December 6th, 1906, Mr. W. E. Conklin, Assistant Superintendent of Construction, says:—

"GENTLEMEN:—In reply to your request for information as to our experience with the redwood ties furnished us by the California-Manila Lumber Commercial Company, we beg to inform you that many of these ties have been in the track (Manila electric railway system) for about two years, and in all portions of the track dug up for repairs no signs of anay or rot have appeared. The ties still seem to be in very good condition. These ties, of course, are not as satisfactory as hardwood ties for curves unless tie-plates are used, which have not been used here."

RECONSTRUCTION OF MANILA RAILWAY COMPANY

The directors of the Manila Railway Company have announced from their London office that negotiations for the reconstruction of the company necessary to carry out the terms of settlement with the United States Government, set forth in the circular of August 3d last, sent to the shareholders, are concluded, and are contained in a plan of reconstruction issued to the shareholders with the report for the year ended December 31st, 1905. The plan has received the careful attention of the directors, and has been adopted by the shareholders.

Claim Against United States.—The directors recall that after the Spanish-American War the company presented a claim for the amount due under the guarantee given with the Spanish concession; but liability was denied by the Washington Government. After the return of the railway to the company there were presented to the United States Government claims for use and for damages. In June, 1905, the Philippine Government invited tenders from United States or Philippine Corporations or citizens for the construction of various lines on the Island of Luzon, as well as on other Philippine islands. Two members of the Board of Directors proceeded at once to Washington to take up again with the British Ambassador the negotiations for damages. After much consultation Messrs. Speyer & Co., of New York, with a view to coöperating with the company, and at the same time, as far as possible, to protect the shareholders' interests, presented a bid for the construction of various lines on the Island of Luzon, which were considered to be profitable commercial enterprises if worked in connection with the railroads owned by the company. None of the bids presented were accepted; but, as the result of subsequent negotiations, an award was made to Messrs. Speyer & Co. of a concession for these lines, which have now been assigned to a New Jersey Company organized by them, known as the Manila Railroad Company. The concession which has been granted to the American company is a perpetual concession, qualified only by the not unusual condition that it is subject to amendment, alteration or repeal by the Congress of the United States. It authorizes and requires the construction of 450 miles of railroad in the Island of Luzon, which are reported by Mr. Horace L. Higgins, general manager of the Manila Railway Company, Ltd., to be likely to be remunerative, and provides that the favorable rates of taxation prescribed in respect to the new lines shall apply to the existing lines when owned or operated by the American company, and that the concession or franchise shall appertain to the English company's lines when it shall have fully discharged all claims against the United States and the Philippine Government. Mr. Higgins, who has been closely associated with the Manila Railway since its formation, has agreed to take the office of President and General Manager of the American company.

A Satisfactory Position.—In the opinion of the directors the position thus brought about is thoroughly satisfactory. They have, therefore, with the assistance of Messrs. Speyer & Co., in New York, and Messrs. Speyer Brothers, in London, very carefully considered how to effect the transfer of the property to the American company and the construction of the new lines, at the same time ensuring that practically the entire net revenue of both the present system and the new lines shall be retained. A new English company will be formed called the Manila Railway Company (1906), Limited, referred to herein as "the new company," which will act as a holding or securities company. As part of the plan, the following agreements will be made:—(1) An agreement with the American company under which the English company will sell its undertakings in consideration of an agreed amount of the American company's securities; (2) an agreement with the new company under which the old company will nominate the new company to receive such securities in consideration of the new company's issuing to the old company an agreed amount thereof; (3) an agreement between the new company and American company for purchase by the new company of bonds and shares of the American company to be issued to obtain money for construction of new lines and other corporate purposes. Under the provisions of the Act of Congress applying to corporations doing business in the Philippine Islands, bonds and shares of the American company cannot be issued except in exchange for actual cash or for property at a fair valuation equal to the par value of the bonds or shares so issued.

The effect of the arrangement will be that there will be vested in the new company, as a holding company, practically all the bonds and shares issued by the American company. These will be vested by the new company in trustees, and against them will be issued the shares and securities of the new company, the prescribed portion of which will be offered to the shareholders in exchange for their existing holdings. The securities of the new company will thus have a charge on the entire net revenue, not only of the 208 miles of the present system, but of the further 420 miles to be built under the new concessions.

New Company.—The Manila Railway Company (1906), Limited, will have an authorized capital of £4,000,000, divided into 200,000 5 per cent non-cumulative preference shares of £10 each and 200,000 ordinary shares of £10 each. There will be a present issue in 4 per cent "A" debenture bonds of £1,600,000 and in 4 per cent "B" debenture bonds of £1,730.000. Power will be reserved in the trust deed that further amounts of each class of debenture bonds may be created and issued for the acquisition of securities issued by the American company for the construction or acquisition of new mileage or other capital purposes, provided that the total amount of bonds to be issued for the construction or acquisition of new mileage shall not exceed the rate of £5,000 of each class per mile, and that for other capital purposes the amount to be issued shall not exceed £50,000 *per annum* of each class. It is proposed to deal wth the securities and shares of the new company as follows:—Four per cent "A" debenture bonds: In exchange for the securities of the present company, £1,257,200; issued to provide funds for the requirements of the plan, £342,800; reserved for future construction and equipment, £1,400,000; total £3,000,000. Four per cent "B" debenture bonds: In partial exchange for the securities of the present company, £730,000; issued to provide funds for the requirements of the plan, £1,000,000; reserved for future construction and equipment £1,270,000; total, £3,000,000. Preference shares: In exchange for the shares and securities of the present company, £1,180,000; issued to provide funds for the requirements of the plan, £820,000; total, £2,000,000. Ordinary shares: In exchange for the shares of the present company, £399,270; reserve for new company, £1,600,730; total, £2,000,000.

The interest charges on the £1,600,000 "A" debenture bonds and £730,000 "B" debenture bonds will amount to £93,200, thus reducing the annual interest charges by about £15,000. Mr. Higgins estimates that the net income of the present system of 208 miles, having regard to the increased traffic, which should be brought as each connecting branch of the new system is opened, will be £116,000 for 1906, and will by 1912 have increased to £153,100. It is estimated that the construction of the 420 miles of new railroad will cost approximately £3,100,000, for which the issue of the securities reserved for this should fully provide, and that construction should be completed in 1911. Mr. Higgins estimates that the yearly net earnings of the sections, beginning with 1907, should be as follows: £4,200, £29,300, £66,900, £112,200, £135,800, £155,000. The total estimated net revenue of the 628 miles when completed and in operation will be £308,100.

Terms of Exchange.—The securities to be received in exchange for each principal sum of £100 existing securities are as follows: For 5 per cent first mortgage stock, £112 new 4 per cent "A" debenture bonds and 16s.8d. for accrued interest to December 31st, 1906; for 6 per cent prior lien bonds, Series "A," £120 new 4 per cent "A" debenture bonds and £3 accrued interest; for 6 per cent prior lien bonds Series "B" £115 new 4 per cent "A" debenture bonds and £3 accrued interest; for 6 per cent secured notes, £112 new 4 per cent "A" debenture bonds, with £3 0s. 4d. accrued interest; for 6 per cent debentures £100 new 4 per cent "B" debenture bonds, £100 new preference shares, and £6 cash; for 7 per cent cumulative preference shares, £150 new preference shares; for ordinary shares, £300 new ordinary shares; for deferred shares £300 new ordinary shares.

Annual Report.—The report of the Manila Railway Company, Ltd., for the year ended December 31st, 1905, states that the traffic receipts amounted to $1,694,820 and the expenses in Manila to $723,040 leaving $971,779, which, at 2s. exchange, is equal to £97,178. The profit on working the quay line amounted to £1,429, and the profit in exchange to £242, while the charges in London were £3,790, leaving as net revenue £95,059, out of which interest has been paid on first mortgage registered stock (£7,500) and on prior lien bonds, "A" and "B" (£35,100). The value of the Philippine currency has remained steady throughout the year at slightly over 2s. per dollar. The claims against the governments of the United States and of the Philippine Islands have been settled, subject to the consent of the shareholders and security holders, on the terms stated in the chairman's circular of August 3, 1906. The company's claims on the Spanish Government are being prosecuted, but the directors regret that they are still unable to report any recoveries. The construction of the extensions has made good progress. The receipts from extensions to December 31st, 1905, are £13,305. The amount paid for interest on secured notes during 1905 was £20,250, so that a debit balance of £6,944 is carried forward to 1906.

TIENTSIN TRAMWAY SYSTEM

According to a correspondent of the *North-China Daily News*, the new iron bridge of the Electric Tramway Company in the City of Tientsin is now open to traffic. The hours of opening and closing the bridge are fixed conformably with the time-table of the trains of the Imperial Railways of North China, in the same way as the International Bridge in the French Concession which was built by the Powers when Tientsin was in the hands of the Provisional Government after the Boxer troubles in 1900. The new bridge is lighted with electricity and policed by both Chinese and Austrian constables, because it is connected with the Austrian Concession on the other side of the Peiho. The structure is practically divided into four parts, *viz.*, two sidewalks are reserved for pedestrians, while one-half in the middle has been laid with rails for the passing of the electric cars and the other half for vehicles. The company is now laying rails in the Austrian, Italian and Belgian concessions at Hotung, east of the Peiho, in order to run cars straight to the Settlement Station of the Imperial Railways, and the first cars will soon be placed in commission. The company is negotiating with the Japanese municipal authorities at Tientsin for the tramway to pass through their concession. It is believed that the company will also shortly commence negotiations with the French, British and German authorities for the same purpose, so that passengers will be able to travel from the various foreign concessions to the city and *vice versa* without interruption in future. Sometime ago, the company had trouble with the Chinese officials arising out of the accidents to native pedestrians alleged to be caused by carelessness on the part of the Chinese conductors. But this defect has now been practically remedied by the placing of nets outside the moving cars and the stationing of coolies with red flags, in the day time, and red lamps during the night, at the most important points of the route by the company and the issue of an official notice by the Chinese Police Commissioner prohibiting pedestrians and ricsha coolies from being near the moving trams under pain of severe penalties. It is hoped that by the joint energy of the Belgians and the Chinese authorities accidents may be prevented hereafter. The Japanese authorities have appointed a committee to consider the proposals of the company and whether the line should be a single or double one in their concession in Tientsin.

BOOK REVIEWS

Technical Terms (Spanish and English) by ANDRES J. R. V. GARCIA; Spon & Chamberlain, New York.

This little volume is of convenient pocket size, and contains 3,000 technical terms in both languages, conveniently indexed. Its object is to satisfy the demand for an up-to-date technical dictionary of the terms in general use by engineers. The Spanish Index will be found to be a specially valuable feature in translating from Spanish into English .

Mechanical Draft (with 27 original tables and 13 halftone plates), by J. H. KINEALY; Spon & Chamberlain, New York. (Price $2 gold, net.)

While this book is intended primarily for the practical engineer, full explanations of the various steps leading up to the finished design of the mechanical draft apparatus have been given with the hope that the book may prove of value as a textbook for young engineers and students.

Hydrographic Surveying (illustrated), by SAMUEL HILL LEA, M. Am. Soc. C. E.; The Engineering News Publishing Company, New York. (Price $2 gold, net.)

This work is especially intended for engineering students and the younger members of the profession; but it is also particularly useful to those of larger experience, but not familiar with the minor details of this class of work. The author takes up his subject in a clear but simple form, using illustrations very freely. Complicated mathematical forms are avoided as being actually unsuited to the ordinary methods of field work.

The Model Library; Spon & Chamberlain, New York.

Volume I of this useful work has been received and is devoted to electrical engineering, divided in four books, under the following captions: —"The Study of Electricity," "How to Install Electric Bells, Annunciators and Alarms," "Dry Batteries," and "Electrical Circuits and Diagrams."

Economics of Road Construction (second edition, enlarged; illustrated), by HALBERT POWERS GILLETTE; The Engineering News Publishing Company, New York. (Price $1 gold, net.)

This is a practical, concise and complete treatise on the economics of road construction, dealing with all branches of engineering in the subjects discussed. The fact is brought out that economic road construction is not the first consideration of some engineers, however excellent otherwise may be the structures designed by them. It is shown that to perform earthwork economically the engineer must understand the efficiency of modern tools that can be used, and so desigu the cross-section of a road as to make such use possible. The author has shown that deep cuts may be avoided by a consideration of the fact that the power of a team is not constant, but may be as great as 1,000 lbs. tractive pull for a short time—sufficient to mount a grade of 7 per cent with a net load of four tons, and has indicated the possibility and desirability of reducing the width of cuts by the use of sub-drain, and the necessity of keeping the mouths of such drains open. The necessity of screening all gravel, etc., are also dealt with. Altogether, the work is a most valuable one.

City Roads and Pavements (third edition, revised; illustrated), by WILLIAM PIERSON JUDSON, M. Am. Soc. C. E.; The Engineering News Publishing Company, New York. (Price $2 gold, net.)

This edition has been prepared in response to the continual call for the book as a guide in the building of rural highways as well as of city pavements. Additions are made, in the text and in the foot-notes, giving recent changes in methods. The sections entitled respectively "Concrete Base," "Block Stone," "Wood," "Vitrified Brick," "Asphalt," "Bituminous Macadam," and "Broken Stone," are made to accord with the latest records of methods and costs, using illustrations and tables for brevity.

Electrical Instruments and Testing (illustrated), by NORMAN H. SCHNEIDER, Spon & Chamberlain, New York.

This book is intended for practical use and also as an introduction to the larger works in "Electrical Testing." The apparatus described is modern and universally adopted. The tests are such as occur daily in the work of the engineroom, powerhouse or technical school. The formulas given are explained in the text preceding them, and examples are worked out in simple arithmetic. Formulas are often looked upon as intricate mysteries by those who do not understand them. In reality they are often very simple and very necessary. The use of formulas is but a method of arithmetical shorthand. A few minutes devoted to a formula will render it clear and its use easy to those of limited arithmetical education. This is a most valuable feature of the book.

Electric Power Plants (illustrated), by NORMAN H. SCHNEIDER; Spon & Chamberlain, New York City.

In this revised edition the author has incorporated a complete chapter on wiring, and wherever practicable the rules of the National Board of Fire Underwriters (United States) have been followed and explanation of the rules given wherever necessary. Motors, both direct current and alternating current, are considered in a separate chapter and the modern forms of starting rheostats described at length. In the chapter on generators, the principles of alternators are considered, as also transformers and their applications. Modern testing instruments and their use, and the wattmeter, and its testing, are dealt with in a separate chapter. In the storage battery section much new information has been added and the batteries used in automobile work treated of. This addition has been made as it is the duty of most powerhouse operators to attend to the charging of automobiles either commercially or occasionally.

Modern Tunnel Practice (illustrated), by DAVID MCNEELY STAUFFER, M. Am. Soc. C. E.; The Engineering News Publishing Company. (Price $2.50 gold, net.)

This volume is illustrated by examples taken from actual recent work in the United States and in foreign countries. The practice of tunneling, in many of its important features, has been radically changed within a comparatively short period by the introduction of high explosives, by the use of machine drills, by special appliances for handling the debris or projecting the roof of the tunnel, and by the employment of electric power and light As a consequence of these innovations, much that was useful to the engineer and to the contractor in the older works upon tunneling is now out of date; and with this in view the present work has been compiled. In the arrangement of this volume, especial effort has been made to present modern practice in tunneling under as many varying conditions as possible, and to clearly and concisely describe the methods actually adopted in carrying out the work under certain controlling conditions. The material used is very largely taken up, and in every case the description of any special method is prefaced by a brief statement of the physical conditions which call for some particular treatment. The composition, nature and use of modern explosives have been treated at considerable length; but under this head much has been left out that is considered as having little or no useful bearing upon modern practice in tunneling building.

Universal Dictionary of Mechanical Drawing (illustrated), by GEORGE H. FOLLOWS; The Engineering News Publishing Company, New York.

In a paper on *Mechanical Drawing in the Modern Drafting Room* read before the Engineers' Society of Western Pennsylvania, in June, 1903, the author dwelt with some emphasis upon the importance of uniformity in what he then termed the "dictionary," features of mechanical drawings. This paper was reprinted by the society as a pamphlet. As a result it seemed to be the unanimous opinion that such a dictionary, dealing with mechanical drawing as a language, would be appreciated by teachers, students, and drafting rooms alike. This book is the result. It has been written with the hope that the drafting fraternity, as well as teachers and students of mechanical drawing, will use it as the basis for the writing of the language.

PHILIPPINE RAILWAY MATERIALS

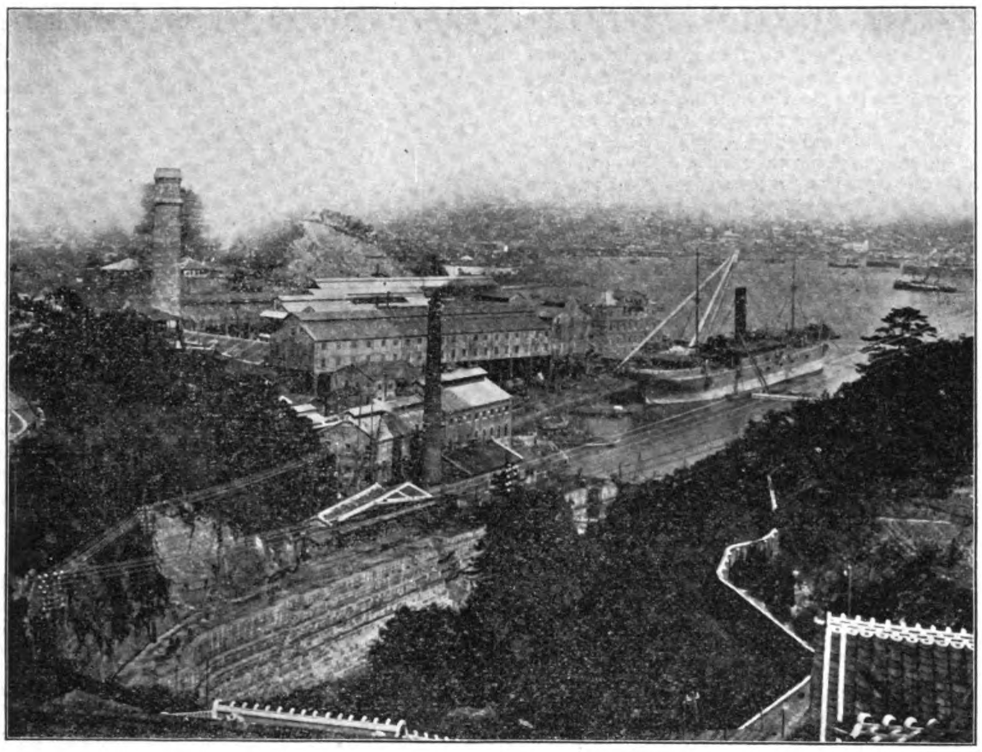
An administrative circular, issued by the chief of the Bureau of Customs of the Philippine Islands, publishes regulations for the free entry of materials to be used in the construction and equipment of the railways now building on the islands of Luzon, Panay, Negros and Cebu. Under the act of the Philippine Commission which granted the concessions to the White and Speyer syndicates, the following materials are exempted from customs duties:—(*a*) All materials used in surveying, including engineering instruments, tools, books, stationery, tents, kitchen utensils and stoves, draughting tables and draughting supplies, cots, chairs, blankets and bedding, surgical instruments and supplies, medicines, harness, saddles, and other equipments usually employed in railway surveys excluding, however, subsistence and commissary supplies and clothing and personal effects of employees. (*b*) All material for the general and local offices of construction administration, including office furniture and fixtures, stationery and supplies, testing machines and like material and supplies. (*c*) All construction material, including wagons, carts, scrapers, graders, dump carts, push cars, steam or gas traction or hoisting engines, trucks, pumps, pipe, pipe tools and fittings, pile drivers, steam shovels, steel rails and fastenings, telegraph instruments and wire, insulators, poles and other like supplies, sawmill machinery, ties, timber for bridges, water tanks and building, sashes, doors, blinds and mill work, roofing material, cement, plaster, lime, paint, varnish, and other similar building supplies, steel and iron bridges turn tables, roof trusses, and structural iron of all kinds, frogs, switches and crossings, interlocking and signal apparatus shop machinery and tools, hand tools of all kinds and descriptions, hardware, oil, coal and waste used on construction trains, ships or launches, horses, mules and draught animals, including hay, grain and forage for same, and any and all necessary material and supplies used wholly on railroads built under concessionary contracts or grants. (*d*) All material for equipment of railroads built under concessionary grant or contract or by any railroad specially granted exemption by law, such material for equipment being motive power and rolling stock for use on construction of railroad and for equipment of same to enable it to properly operate the mileage constructed under its concessionary contract or grant.

A vessel having an entire cargo consigned to the railway company at a port of entry will be allowed to unload any portion of the cargo and then proceed under special permit to any other port or place in the same collection district after the entire cargo has been entered and cleared at the port of entry. A vessel having an entire cargo consigned to the railway company at Cebu, a part of which the company may find necessary or desirable to forward to Iloilo may be permitted to clear the entire cargo at the port of Cebu and then to proceed with such portion of the cargo, on proper manifest and permits, to the port of Iloilo, for discharge in that collection district, and vice versa. Upon arrival of such cargo at Cebu from the port of Iloilo it may be treated in the same way as is specified in the preceding paragraph, with the exception of proper clearances which will have been accomplished at the port of Iloilo.

The following named persons have been empowered in due form by Mr. E. J. Beard, Chief Engineer of the Philippine Railway Company, to perform any and all acts in connection with clearing imported material and supplies at the various ports of entry, and as incident thereto to sign bills of lading, free entry, and all other documents in connection therewith, and generally to transact at the customs offices at Manila, Iloilo and Cebu, respectively, all customs business in which the said railway company is or may be concerned:—Mr. Theobald Diehl, Purchasing Agent, and Mr. C. B. Sawyer, Chief Clerk, for all ports; Mr. H. E. Geer, General Storekeeper, for the ports of Iloilo and Cebu, and Mr. F. H. Loucks, Storekeeper, for the Port of Cebu. Mr. H. S. Hogge, of Manila, has been authorized by the General Manager of the Manila Railway Company, Limited, to sign for and represent said company in all matters relating to customs and importations of material and supplies subject to free entry.

MITSU BISHI AND OTHER JAPANESE SHIPBUILDING ENTERPRISES

Japan continues to progress wonderfully in its shipbuilding and dockyard industry. The principal shipyards at Nagasaki, Osaka, Kobé and Yokohama are full up with orders. The factory arrangements are being constantly improved all along the line, and as a consequence the building of ships of over 10,000 tons in Japanese yards is now quite common. The year 1906 was one of extraordinary activity at the plant of the Mitsu Bishi Dockyard and Engine Works, Nagasaki. Besides despatching with promptitude and efficiently a large number of repair and overhaul jobs in vessels of all classes, the concern undertook the construction of no less than 12 steel steam vessels for private companies, in addition to which it has in the docks several warships to the order of the Japanese Government. During the year there were launched at these yards five steel vessels, all of which are designed for steam power. They are the *Joshin-maru*, port of registry Osaka, 1,244 gross tons, and 1,034 i. h. p.; the *Masan-maru*, port of registry Osaka, 1,244 gross tons, and 1,190 i. h. p.; the *Shirasagi-maru*, port of registry Nagasaki, 90 gross tons, and 180 i. h. p.; the *Hitachi-maru*, port of registry Tokyo, 7,500 gross tons, and 4,200 i. h. p.; the *Oga-sawara-maru*, port of registry Nagasaki, 1,456 gross tons, and 1,789 i. h. p. The new work on hand for private interests includes seven steamers, Tokyo being the port of registry of all. Their respective gross tons are 13,500, 13,500, 3,700, 8,600, 8,600, 8,600 and 8,600; their respective i. h. p. is 16,500, 16,500, 8,500, 7,300, 7,300, 7,300 and 7,300. The three largest of these steamers will be fitted with Parson's turbine engines.



ENGINE WORKS OF THE MITSU BISHI DOCKYARD AND ENGINE WORKS, NAGASAKI, SHOWING 100-TON SHEERLEGS WITH WHICH THE STEAMER "HITACHI-MARU," 7,500 TONS GROSS, BUILT AT THIS PLANT, IS BEING EQUIPPED; NO. 2 DOCK IS NEAR THESE WORKS

GROWTH OF YARDS.—Work in the smaller yards is also greatly increasing. The small shipyards on both banks of the Kidzugwa have hitherto devoted their attention to the building of wooden vessels of 200 to 300 tons, but these are now able to build iron ships of 800 tons. The yards at Kayokijima, outside Nagasaki Harbor, which have hitherto been engaged in repairing work, are fast developing into a complete shipbuilding yard.

At Innoshima, Bingo, there are two dockyard companies, one of which possesses two docks measuring 300′ and 364′, respectively, while the other has a dock 410′ in length and is about to open another measuring 300.′ At Nochi and Kinoe there are two shipbuilding yards, each possessing a dock 200′ in length. Kinoe-maru has long been known as a center of wooden-ship building, and the launching of a ship of from 70 to 150 tons is an almost daily occurrence.

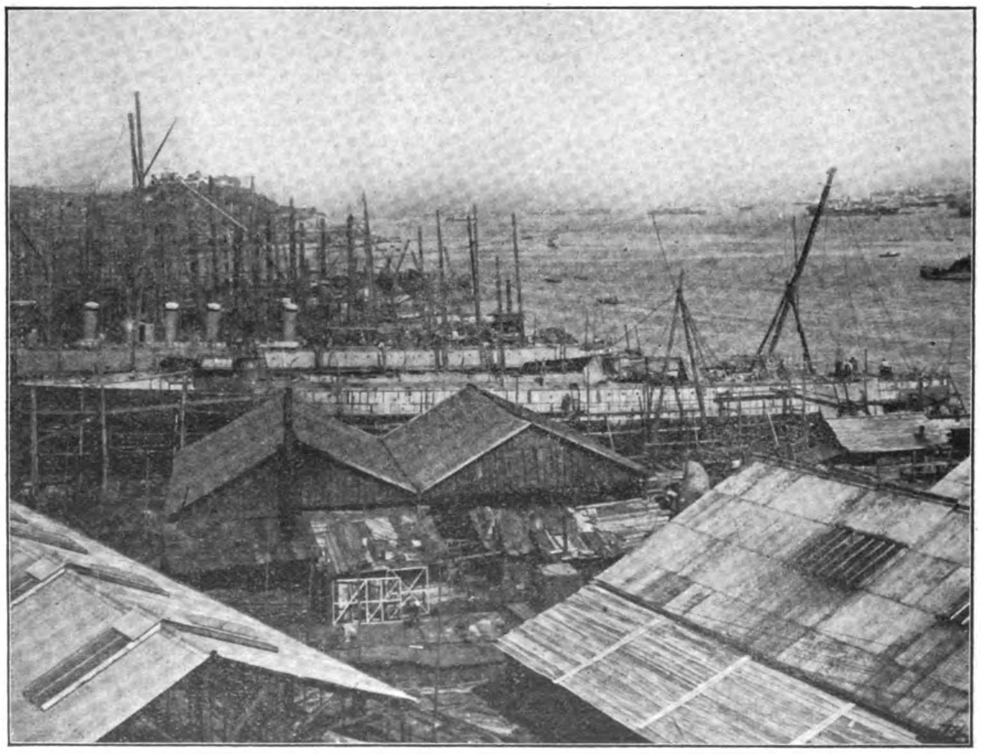
The largest dock in Japan is at Nagasaki, which measures 728′, the next being at Yokohama, with a dock of 552′, the third largest at Hakodate, being 534′ long. The floating dock owned by the Nagasaki company is 412′ in length and is capable of floating a dead weight of 7000 tons. Another and larger floating dock is now being built by the same company. The docking business, like the shipbuilding, is now in a very prosperous condition.

The technical knowledge of shipbuilding among the Japanese has also made progress, compared with eight or nine years ago, when the *Hitachi-maru*, 6,000 tons, was built. At that time the engineers and mechanics experienced difficulty in building the steamer, but now they are able to build larger vessels with greater ease and expedition. What is necessary in Japanese shipbuilding is the further subdivision of labor among the various departments of the industry. If this is done, shipbuilding can be executed with more dispatch. There is scarcely any doubt that with the development of the shipbuilding industry in Japan orders from foreign countries will increase.

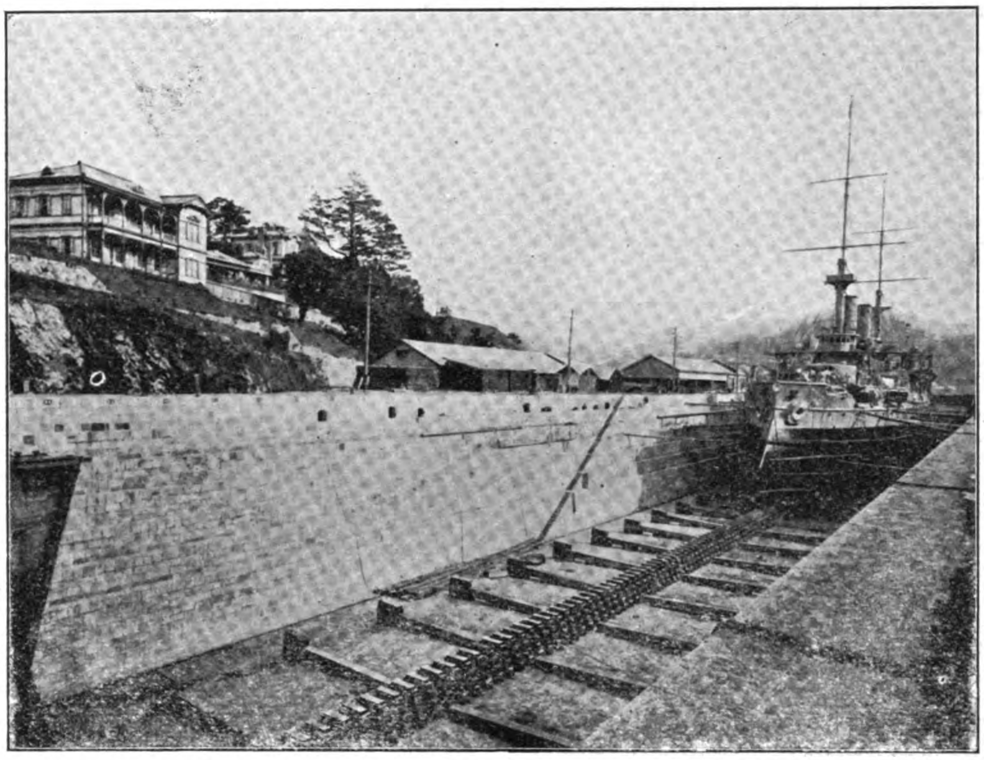
SEEKING LEADERSHIP ON PACIFIC.—The Toyo Kisen Kaisha is vigorously at work building a new trade on its new line to Chile. It has chartered the *Kusuho-maru* (formerly the *Aryol*, 9,085 tons) from the naval department and also the *Kasado-maru* (formerly the *Kazan*, 6,070 tons), and, substituting these for the one vessel hitherto on the line, it will organize a regular monthly service between Hongkong and Chile *via* Japan ports.

The Nippon Yusen Kaisha is now in strong competition with foreign steamers on the Swatow-Bangkok line, the Shanghai line, the Australian line, and the Shanghai-Hankow line. The contest is growing intense and especially strong between the Japanese company and the great British firm of Butterfield & Swire.

It is clearly evident to a casual observer that the Japanese have a belief and faith in their power to become the masters in the coasting trade of this part of the world, and are perfecting their plans with this object in view. They are laying a foundation now, which surely will give them most excellent advantages to control the shipping between the United States and the Orient. Their first advantage lies in the economy of operation, due primarily to the cheap wages and good service of their seamen and officers and the abundance of well-trained and good seamen.



PART OF THE MITSU BISHI'S SHIPBUILDING YARDS



MITSU BISHI'S NO. 3 DOCK (714' ON BLOCKS) WITH H. I. J. M. WARSHIP "IKI" ON THE STOCKS

GOVERNMENT SUBSIDIES.—Subsidies are given by the Government on all ships constructed in Japan for the Japanese. The sum allotted in the budget for the current fiscal year under the heading of encouragement to shipbuilding is only $361,250 gold (which is exclusive of sums paid to existing steamship lines), and Tokyo papers say that it will prove quite insufficient. Speaking broadly, the rate paid for vessels built in Japanese dockyards and satisfying the required tests are $10 gold per ton for the hull and $5 per h. p. for the boilers. Fourteen vessels, totaling 55,488 tons, will come within the scope of the provisions, and the subsidy will amount to $1,150,000 or $1,200,000, so that there will be a deficiency of something over $750,000. The Government will probably pay it out of the reserves and embody it in a supplementary budget for the Diet's approval. The tonnage under construction amounts to 55,488 tons for the 14 vessels ordered.

In addition, the Nippon Yusen Kaisha have ordered six vessels of 8,500 tons each, and there are two ships building of 2,800 tons, which will not be eligible for bounty. Thus the total under construction is 22 vessels, aggregating 112,000 tons.

A subsidy is paid to mail steamers sailing not only to Europe, America, and Australia, but also to lines operating practically in a coasting trade in China, in connection with Japan. These steamers run on regular schedules to all of the important ports in China, going not only to Korea, Dalny, Chefoo, Newchwang, Tientsin, Tsingtau, Shanghai, and all southern ports, and to the Philippines, but they go 700 miles up the great river Yangtsze to that Chicago of China, Hankow.

At the close of 1903 Japan possessed 657,000 tons of steamers and 320,000 tons of sailing vessels. In 1905 the number of steamers was increased to 939,000 tons and that of sailing vessels to 336,000 tons, making a total of 1,275,000 tons. The vessels include 338 under 5 years, 331 from 5 to 10 years, 257 from 10 to 15 years, 181 from 15 to 20 years, and 131 up to 25 years, thus leaving only 148 over 25 years old.

INCREASE IN THE CHINESE TRADE.—Amoy continues to lose the Formosan tea trade with the development by Japan of Keelung Harbor, and making that the tea port for Formosa. The ultimate object is to make Keelung Harbor accessible to large trans-Pacific steamers. Japanese direct lines are being operated from Keelung to Kobe and Nagasaki, and the decrease in the Amoy tea shipments from 17,812,666 lbs. in 1902 to 12,304,495 lbs. in 1905 shows how much these lines have affected local shippers. In Amoy's busy days three British steamer lines were operated between Formosa and Amoy, but the Japanese lines have driven them entirely out of the Formosan trade. The company accomplishing this is the Osaka Shosen Kaisha, which now operates 11 ships plying up and down the coast, calling at all the ports between Hongkong and Shanghai, and from Amoy to Tamsui and Keelung in Formosa. Douglas Lapraik & Co., which firm formerly had seven steamers, has curtailed its run from Hongkong to Fuchau, and is operating only three steamers. Butterfield & Swire still maintain an irregular service, but the major portion of its once enormous coast fleet is tied up in Hongkong or Shanghai.

This remarkable growth in Japanese owned and operated steamers is due largely to the subsidizing of Japanese steamers by the Japanese Government. This subsidizing enables the Japanese lines to maintain their service with low freight rates that can not be met by the British companies.

Japanese goods are being pushed and find a ready market, while the products of other nations, similar in character but better in quality, find no market. Japanese firms are gaining a foothold in the treaty ports, and the number of the Chinese that are becoming Japanese subjects is surprising. It might be well to mention that the Japanese consuls have power to confer Japanese citizenship upon Chinese subjects. There are in the various treaty ports of China, according to the last Imperial Chinese Customs report, 729 Japanese firms and 16,910 Japanese citizens. The next in rank are British firms to the number of 434, with 8,493 British citizens. The United States shows 105 firms and 3,380 citizens, and Germany 197 firms with 1,850 citizens.

CAN CHINESE RUN THEIR RAILWAYS?

China Coast papers have been discussing this question during the last month with more or less avidity, and the following article on the subject, reproduced from the *China Mail*, indicates quite well the trend of the discussion:—

"The condition of unrepair into which the Canton-Samshui Railway has fallen during the two years it has been open to traffic, has of late been much discussed in business circles. On all sides, without exception, as far as we have been able to hear, the blame for this has been thrown on the Chinese authorities. The general opinion appears to be that, as with other things, the Chinese, once having built a railway line, expect it to last forever, and go on earning money without further outlay on their part. This is known to be so with Chinese-owned ships—the meanest run ships on the coast—and with armament, cannons once bought being allowed to rust into uselessness to save the expense of keeping men to look after them properly. Warships share the same fate, while a walk in any really Chinese town will show bridges, houses, temples and numerous costly works crumbling away for the want of the proverbial stitch in time.

"Such are the arguments used against the Chinese when it is asked, 'Can they run their own railways?' and the Canton-Fatshan and Samshui line would at first glance appear to be direct evidence in favor of a negative answer. However, before passing judgment it is well to hear both sides. We have on numerous occasions heard the story from the standpoint of the foreigner, but a chat a representative of the *China Mail* recently had with Mr. K. G. Kwong is one of the first opportunities of hearing what the Chinese have to say for themselves.

"Mr. (or Taotai) Kwong, it may be explained, was some three or four months ago appointed engineer-in-charge of the Yuenhan Railway Company's lines. He is a Chinaman of the modern school, with very advanced ideas, speaks English perfectly, and has a knowledge of railway matters acquired during eight years' study in America, where he was generally recognized as a keen observer and a man of ability.

"Taxed with the somewhat aggressive assertion:—'You Chinamen are a nice lot to attempt and run railways—You never think of repairs—Just look at the line between Shekweitong and Fatshan!' he replied:—'Oh, yes; you always say it is we Chinese! Often, perhaps, you are right; but this time you are wrong. Now the Swatow-Chaochowfoo line was built under close Chinese supervision by the Japanese; it is a fair line. It could be improved in many ways, but it is fair. The Canton-Samshui line was built by foreigners (Americans) and is a disgrace to all who were connected with it. It was never properly constructed. There came a time when a line of some kind had to be built, and things were not ready. Some kind of a roadbed was hurriedly thrown up and rails laid, and there was the line which you blame us for not keeping in good condition. The task was impossible from the start and all that can be done is what we are doing now—practically rebuilding the whole thing.'

"The interviewer was aggressive, and replied:—'You people are ever good at explanations. You *squeeze* nearly all the money that should be spent on repairs and then rely on something like this to explain it away.'

" 'Well, I like that,' retaliated Mr. Kwong. 'Chinese officials and others do *squeeze*, and I am not going to deny, and I have seen some fairly good examples of it. The best samples of *squeeze*, however, that I have ever known or heard of are insignificant compared with things I could tell you about your boasted foreigners and our railway lines. Mind! I have the books. Things doubled in price in a most mysterious way. We paid high prices and got nothing worth having for our money.'

"Mr. Kwong added that he knew how a railroad should be run and how it should be built. The Yuenhan Company was spending money freely on its branch line and when in a few months' time the repairs are completed it will be, for the first time, he declared, in thorough good working order. On the Hankow line the company was also making progress and it would not be many months before the first section of 10 miles would be open to traffic. All the fighting and squabbling that had taken place about the directorship of the Hankow line was so much bearing the air. The main point was that the money was safe and the people were interested. A good line would be built and the prospects for its success were very satisfactory."

FIGHT AGAINST THE SUGAR INDUSTRY OF THE PHILIPPINES

[In an address at the recent banquet of the National Association of Manufacturers, held in New York City, Mr. William H. Taft, Secretary of War and formerly Civil Governor of the Philippine Islands, made a strong plea in favor of fair commercial treatment of these possessions by the home country. Extracts of this address are reproduced herewith, together with our own analogous observations.—EDITOR'S NOTE.]

Recurring to the special interests that are opposing the Philippine Tariff Bill, they are, first, those interests that are raising and manufacturing sugar in this country, and I am going to ask you to go into a few statistics with me upon the subject of the consumption and the production of sugar in this country and in the Philippines, because without doing that you can not understand the question — *Secretary Taft*

A trust capitalized at $20,000,000 gold is at present being formed by the Louisiana sugar planters and manufacturers, with one of the Oxnards as an incorporator, according to a recent issue of *The Louisiana Planter and Sugar Manufacturer.* This means nothing more nor less than a merger with the American Sugar Refining Company. Already the beet-sugar factories have gone into the trust, and now the cane-sugar interests of Louisiana are taking the same step. So all the sugar interests of the United States are coming under one head—the American Sugar Trust. Of course this trust will continue to fight the reduction of duties on Philippine products, where the friends of the trust are most numerous, in the Senate of the Congress at Washington. It would certainly seem about time for the Administration to rebuke this huge combination, to the extent, at least, of placing it in a position where its fight against the removal of the duties on the products of these Islands

The demand in this country for sugar amounts to 2,700,000 tons *per annum,* and we raise in this country, including Porto Rico, and Hawaii, and Louisiana, and the beet-sugar production, 1,100,000 tons, of which 300,000, or exactly 265,000 tons, are produced by the beet-sugar manufacturers. Now, that leaves to come off the tariff wall, 1,600,000 tons of sugar, and we exported from the Philippines last (1905) year 100,000 tons to everywhere, and half of it came here. Now, of that 1,600,000 tons, about 1,000,000 tons came from Cuba and paid a duty of 20 per cent less than the Dingley Tariff Fifty thousand tons came the same year from the Philippines, and paid a duty 25 per cent less than the Dingley rate, and 450,000 tons of Java, paying the full Dingley rate; 100,000 tons came from the West Indies and other islands, paying the full Dingley rate. Now, it is not necessary for me to explain to intelligent business men, men of affairs, that what will affect the producer of sugar in this country is the reduction of price. That is the first proposition. Secondly, it is not necessary for me to explain that the price of sugar in this country, as long as we have to import sugar and bring it over the tariff wall, is fixed by what it costs to import the sugar into this country. And it follows that as long as we have to import sugar and bring it over the tariff wall at the full Dingley rates, the introduction of sugar from the Philippine Islands can not affect the price at all. All that it will do will be to substitute it for sugar that now pays the full Dingley rate, or that pays 20 per cent off the Dingley rate, and that is all.—*Secretary Taft.*

Consumption of sugar the past (1906) year in the United States, while official figures are not yet at hand, is known to have been larger than ever before. The beet-sugar lobbyists last spring at Washington claimed that the quantity of sugar going into the United States paying the full rate of duty, would be cut down to 100,000 or 200,000 tons in 1906; and to nothing in 1907. As a matter of fact, it will be shown to have been much nearer 1,000,000 tons of full-duty sugar entering the home country in 1906 than it was 100,000 tons. The sugar people invariably calculated on phenomenal increases in consumption. The United States has for 50 years or more, increased her consumption much faster than her production and in all probability will continue to do so. The American beet-sugar production will prove larger in 1906 than ever before. The Louisiana cane crop, however, will be shorter than for some years. The decrease from Louisiana will hardly be made good by the increase in the beet production. In the meantime consumption of sugar in the United States is growing enormously, being much larger last (1906) year than was ever the case before Instead of the United States growing in production so as to supply her own needs of sugar, the requirements from the outside are increasing constantly in spite of the addition of sugar-growing colonies such as Hawaii and Porto Rico. If the sugar of the Philippine Islands were also admitted free, the same condition would continue—the consumption would grow faster than the production, and no sugar-grower in the homeland would be hurt.

In other words, all we are asking for the Philippines is an opportunity, with the beet-sugar men and the Louisiana sugar men, to share the opportunity to get at that 1,600,000 tons that now come over the tariff wall. We would like to have an opportunity to furnish part of that, at the price that is paid in this market for sugar. Now, the objection made is that the Philippine Islands have such capacity for producing sugar that the minute you let them into this market, the 1,600,000 tons of sugar that we now import will be produced in the Philippines. In other words, the production of sugar in the Philippines must increase 16 times before it can affect the price of sugar in this market to the detriment of those who are now manufacturing sugar and selling it behind the tariff wall. Now, I ask if that remote contingency of a growth of 16 times in an industry in the Philippines is not a dream of something so remote that it ought to be disregarded altogether in the question of doing justice to the Philippine Islands.—*Secretary Taft.*

The Philippine sugar production virtually continues at a standstill. Production has gone up from about 100,000 tons of sugar to 125,000 tons in a few years, but it must be remembered that this sugar is of so low a grade as to be worth no more to the refiner than 80,000 or 90,000 tons of 96 degree sugar now turned out by all the up-to-date sugar countries. It is too early yet to predict what the present crop will amount to, though it is known that the smaller part of the crop grown on the Island of Luzon is quite poor; and there is, unfortunately, no sign of improvement in the general sugar business elsewhere throughout the Islands. No new machinery is going in except of the same kind as the old, which is constantly wearing out. Three-roller mills and open castiron kettles for boiling are universal, as has been the condition in the Islands ever since the commencement of the industry. The molasses is all cooked down nearly dry with the sugar, so the product must of necessity be of very low grade and of unsatisfactory value. Yet the sugar industry of the Islands and its prospects continue to scare the wits out of the sugar people of the United States.

You will hear a great deal said about the labor in the Philippine Islands and the cheapness of it. If you had to do with that labor I think you would find it was not so cheap as the *per diem* represents. Those people have not been taught to labor. That is one of the things we have to do. The minute that the sugar industry is increased, the wages increase. Our coming into the Philippines has more than doubled, and in some cases trebled, the price of labor there. The sugar industry in the Philippines is in a deplorable condition. Sugar is not being raised and rice is being grown instead of sugar. Now, I ask those to whom I address these remarks to use their influence in favor of doing something which is simple justice to the Philippine sugar planter and which is no injury to any interest of the United States.—*Secretary Taft.*

The mission of Commissioner Judd, representing the Hawaii Sugar Planters' Association, to recruit laborers in the Philippine Islands for the canefields of Hawaii, is acknowledged by the Honolulu papers to have proved a signal failure. Mr. Judd spent several months in the Philippines, and finally left the Islands with about 14 Filipino laborers. The native laborer has never up to this time shown much enterprise in the way of hunting for work or business opportunities. The Filipinos as a whole have never done much from a business or industrial standpoint. There extreme timidity is aptly illustrated by the fact that populous communities live from year to year on land owned by others and pay about two-thirds of all the crops grown to landlords, while within 10 miles in any direction may be found thousands of acres of public land of much better quality than that which they are cultivating which the Government is unable to induce them to homestead and occupy free. Our sugar and tobacco friends in the United States need not have such violent frights about the Filipinos flooding the home markets with sugar and tobacco for a few generations to come.

BRITISH AND CHINESE CORPORATION, LIMITED

At the recent annual meeting of the British and Chinese Corporation, Ltd., in London, Mr. W. Keswick, M. P., presided.

According to *The London and China Express,* the chairman, in moving the adoption of the report of the directors, said that during the past fiscal year the corporation issued no railway loans for the Chinese Government, and, making allowance for this fact, the financial result might be regarded as not wholly unsatisfactory. The construction of the Shanghai-Nanking Railway was making good progress. About 80 miles were open for traffic, 20 miles more would be opened early in the present (1907) year, and the rest of the work was so advanced that the consulting engineers (Sir John Wolfe Barry and Mr. A. J. Barry) anticipated that the entire railway would be finished by June, 1908. If a perfectly free hand had been accorded to the corporation it could have accelerated construction considerably, with the double advantage to the Chinese of a saving in cost and interest and the securing of traffic at an early date. In the present state of things in China, however, this had not been possible, and the consequence was that there had been much loss of time. Taking this circumstance into account, satisfactory progress was being made, and the railway was being constructed in every way as a first-class trunk line of standard gauge, equipped with the best type of modern rolling-stock, and the cost was moderate. Before long it would be necessary to provide funds to complete the line, and the Chinese had accepted their offer for a further installment of the loan which would be issued in due course. The board were anxious to proceed with the Soochow-Hangchow-Ningpo Railway, which would also serve a very populous and prosperous section of the Yangtsze provinces. It would be the subject of a separate and distinct loan, and would be a separate undertaking, but its natural relations to the Shanghai-Nanking Railway, with which it would be linked up at Soochow, suggested that the two lines would be advantageously worked under one administration. A contract had been concluded with the Chinese for a loan to build a railway from Canton to the border of Kowloon, where it was designed to connect with the railway which the Government of Hongkong was constructing to that point from Hongkong. This would make the direct railway connection between Hongkong *via* Kowloon and Canton, which had so long and so ardently been desired by the colony. The loan was for £1,500,000, and was to be issued within eight months at the call of the Chinese Government. As regarded the Nanpiao coal concession, there was nothing to be added with advantage to what was stated in the report. With regard to the investments, he said that they consisted of 22,500 shares of £1 each, 8s. paid, and 225 deferred shares of £1 each, fully paid, in the Chinese Central Railways, Ltd., and 25,000 shares in the British and Korean Corporation. The Korean corporation had so far proved disappointing, the ore, which at first was of a very high grade and yielded gold of the value of about £150,000, having become impoverished below a certain level. The shares had now been written down to the value of £5,000. The Korean corporation had another *proposition* in view which it was hoped might prove of a more permanent character.

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

PERSONAL

MR. WILLIAM B. POLAND, Vice-president and General Manager of the Philippine Railway Company, for which corporation Messrs. J. G. White & Co., Inc., are constructing railways on the islands of Panay Cebu and Negros, Philippine Islands, has arrived in Manila and assumed the duties of Chief Engineer in the interest of the company he represents. Mr. Poland has an enviable record in railroad circles of the United States. He is a graduate in civil engineering of the Massachusetts Institute of Technology, class of 1890, and in 1890-91 he attained a post graduate scholarship in advanced engineering. In 1891-92 he was employed n the service of the United States River and Harbor Works as Superintendent of Construction in charge of location and construction of the Point Judith Harbor of Refuge, and Inspector in charge of a wrecking district on the New England Coast. In 1892-93 he held he position of Engineer in charge of preliminary and location surveys and maintenance work on the Pittsburgh & Erie Railway in Indiana and Illinois, and in 1893-98 he was Assistant Engineer of maintenance of way on the Chicago Division of the Clevelan 1, Cincinnati, Chicago & St. Louis Railway (Big Four), in charge of surveys of yards and terminals and reconstruction work, and in charge of maintenance of way of 460 miles of road. During 1898 he served in the Spanish-American War as Major of Engineers, Indiana National Guard, during which time he also acted as Battalion Adjutant of the 158th Indiana Volunteers. He also held in this year the position of Supervisor of Bridges on the Cairo Division of the Big Four Railway, and Engineer of Construction in charge of the reconstruction of the Baltimore & Ohio Southwestern Railway between Cincinnati and St. Louis, involving an expenditure of about $3,500,000 gold. In 1899 he was Division Engineer of the same line, in charge of both construction and maintenance. In 1902 he was Division Engineer of the Pittsburgh Division of the Baltimore & Ohio Railway, in charge of heavy construction and maintenance, and in 1902-04 he was Superintendent of the Indiana Division of the Baltimore & Ohio Southwestern line. In 1905 he was Chief Engineer and General Manager of the Alaska Central Railway. Mr. Poland is a son of General Poland, U. S Army, retired. He is a member of the American Society of Civil Engineers and of the American Railway Engineering and Maintenance of Way Association, in which he has taken a prominent part and contributed valuable and useful information on railway topics. He comes to the Philippines highly recommended from numerous sources, and is considered one of the foremost railroad engineers in America although yet a comparatively young man.

ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

PROJECTED LIGHTING PLANT, NANKIN.—There is a movement on foot at Nankin, China, for the establishment there of an electric lighting plant. At present the *maloo*, the broad, principal avenue of the city, is lighted by diminutive lamps, with feeble lights some 200 yards apart. The imperial mint possesses the only electric-light installation in the city.

JAPANESE DEMAND FOR WIRES AND CABLES.—With the immense development of electrical enterprises in Japan the demand for copper wires and cables is increasing daily, and the Furukawa Copper-Mining Company has decided to establish a new factory for the manufacture of copper wires at Nikko, the present factory being found to be inadequate to meet the demand. According to the latest report the total output of copper wires from this company's works amounts to about 400,000 *kin* (*kin* 1⅓ lbs.) per month, which is chiefly supplied to the various cable manufacturing companies of Tokyo and Yokohama. The majority of the covered wires and cables used by the Department of Communication is imported from abroad and the native manufacturers are said to be contemplating a cable factory on a very extensive scale.

RAILWAYS AND RAILWAY SUPPLIES

KIANGSHUH RAILWAY.—The first section of the Kiangkan end of the Kiangkan-Hushuh Railway has been opened and the works on the section from Hushuh have been commenced. The bridge which is to span the river will be built first.

NEW MANCHURIAN RAILWAY.—The Peking Government is negotiating to raise a loan from a French syndicate to build a railway along the Sungari River between Samsin and Kweihuacheng by employing Japanese engineers, the material also to be supplied from Japan.

JAPANESE RAILWAY NATIONALIZATION.—Thus far the Japanese Government has taken over three private lines in the main island, *viz.*, the Nippon (¥130,532,450), the Sanyo (¥74,012,980), and the Nishinari (¥1,956,505), the total amount involved being ¥206,582,025. None of this money has yet been paid.

ISHIKARI TANKO RAILWAY.—This enterprise covers a length of about 120 miles through the coal and lumber districts of Sorachi, Kashinai, and Shinyubari, in Japan, and the Government has decided to grant permission for the construction of the railroad for the special use of this company and not under the jurisdiction of the track regulations.

EASTERN SIBERIAN RAILWAY EXTENSION.—A Paris telegram announces that the Russian Government has decided to construct a railway to a point south of Vladivostok *via* Stretchensk and Habarovsk, in order to promote the development of Vladivostok. Russia intends to float a loan in France and Germany for this purpose. Work will commence in the spring.

PROJECTED AMUR RAILWAY.—A St. Petersburg telegram says that the construction of the projected Amur Railway, which is to be commenced in the next fiscal year, is inevitable in view of an article of the Portsmouth Treaty, which entitles Japan to prevent Russia from using the Manchurian Railway for any military purposes—that is the transport of troops or military stores.

WUHU-KUANGTECHOW (CHINA) RAILWAY STARTED.—The Governor of Anhui has telegraphed to Peking reporting commencement of the construction of the Wuhu-Kuangtechow Railway by the Anhui Railway Company. The work began with the building of a bridge over the Wuhu River under the supervision of a Danish engineer with the assistance of some foreign educated Chinese railway students. This is one of the railways in South and Central China to be built with Chinese money only.

TOKYO ELEVATED RAILWAY.—According to the plans of the Tokyo Elevated Railway, some sections of which are under construction, the authorities aim at completing the line between Shizuoka, near Shimbashi, and Yeirakucho, not later than March, 1909. Subsequently the central station will be established, after the completion of which work three elevated lines will be laid so as to join the Kobu, Nippon (Uyeno), and Sobu railways. For this continuous enterprise the Government will ask the Diet for $5,000,000 gold, the establishment of the central station alone requiring an outlay of about $500,000.

RAILWAY CAR FOR EMPRESS-DOWAGER.—The new parlor car which the Empress-Dowager of China ordered in France some months ago for the use of herself and the high mandarins of her suite in their journeys through the country, has been shipped to Peking. The car is divided into six compartments. First of all come two drawingroom *coupés* fitted with divans covered with pale blue silk. These are designed for the attendants of the Empress, and next to them comes the sitting and diningroom of Tsi An herself, which takes up the whole width of the car and receives its light through six great panels of glass reaching from floor to roof. At both ends of the saloon are wide divans, which can be turned into beds when occasion requires.

RAILWAY BRIDGE ACROSS YALU.—The Tokyo Government is reported as having decided to build a railway bridge across the Yalu River at the terminus of the Seoul-Wiju Railway, at a cost of about ¥2,000,000. The bridge, which is to be built at a height of over 40′ above the water, will be 3,239′ long, and will permit of the biggest junks passing underneath by lowering only the mainmast. The structure is to be divided into two parts, one side for railway traffic and the other for vehicles and pedestrians. The work is to commence in April and is to be completed towards the end of 1909. By the time of its completion the Mukden-Antung Railway will be opened to traffic, and a through train service between Fusan and Mukden inaugurated.

MALAYSIAN RAILWAY.—Since the opening of the 33-mile extension of the Federated Malay States Railway, from Tampin, Malacca, to Gemas, Negri Sembilan, the railway extension further south, through Johore, to Johore Bharu, a distance of 120 ½ miles, is proceeding very rapidly, and there are indications of the line to Singapore being completed sooner than was expected a few months ago, when it was estimated that two years would be consumed in completion of the line. The opening of the 33 miles of railway mentioned makes a total distance of the main line now open of 352 miles, thus giving a through service from Penang, Straits Settlements, to the Negri Sembilan-Johore boundary, and upon completion of the section now under construction through Johore a through service will be in operation between Penang and Singapore.

CANTON-KOWLOON RAILWAY.—According to *The London & China Express*, much satisfaction is felt in London at the successful termination of the negotiations concerning the Canton-Kowloon Railway. The conclusion of this long-debated matter is considered a promising sign for the arrangement of other railway negotiations pending in China. The Canton-Kowloon Railway is intended to run from the Kowloon Territory of the Hongkong Government, which is situated on the mainland of China, to the City of Canton. The distance traversed by the line will be about 102 miles, and the route is through a fertile and thickly-peopled country. It will form the most direct communication between Hongkong and Canton. The building of that part of the line in Chinese territory has until now been delayed, owing to the obstructive policy of Chinese officials, but at last they seem to have given way under the pressure of an enlightened Viceroy. The ratification of the agreement involves the issue of a sterling loan for about £1,500,000 in London.

TOURANE-HUÉ RAILWAY, FRENCH INDO-CHINA.—The railway line from Tourane to Hué, French Indo-China, has been opened to traffic. The construction of this line was commenced in the summer of 1901, and its length is 107 kilometers. Leaving Tourane, it follows the coast, and crosses successively the secondary chains which detach themselves from the great Annamite Mountain Range and which extend to the sea, notably the important group of the *col des Nuages*. The railroad includes numerous iron bridges and tunnels, and, notably, between Tourane and Hué, a bridge of 350 metres across the river of Cudé, twelve bridges of 40 to 120 metres, and eleven tunnels representing a total length of 3,290 metres, including two of 840 and 562 metres. In the crossing of the *col des Nuages*, one of 422 and eight of 355 to 110 metres. In spite of this large number of tunnels, the line, following an elevated route along the coast for the largest part of the journey, offers to travellers similar scenery to that of the ancient Mandarin route, which was almost sublimely picturesque. But, further, the Annamite River population will derive considerable benefit. This population, fairly scattered, was really exhausted by the forced labor demanded from it for the transport of goods and passengers. On the other hand, it was difficult to get at Hué by way of the river, owing to a dangerous bar which renders its mouth difficult of access.

PUBLIC AND PORT WORKS, DOCKS, WHARVES, ETC.

BANGKOK DOCKS.—It is announced that German firms are making an effort to secure control of the Bangkok Dock Company.

IMPROVEMENTS AT CANTON.—As the work of improving The Bund of Canton progresses the waterfront is assuming a very different appearance. There are already a number of prominent buildings that give the city something of the appearance of a western rather than an eastern metropolis. Several stretches of The Bund have been completed. While it would not be difficult to find fault with the construction, and many repairs will soon have to be made, the roadway will be immeasurably better than anything Canton has enjoyed hitherto and add much to the prosperity of the city. One of the finest buildings on The Bund is that of the Electric Supply Company. New buildings have been erected upon Dutch Folly and some of the old ones have been repaired.

WATERWORKS PLANT FOR NANKIN.—Agitation for a modern water supply at Nankin, China, has been revived. At the present time the best drinking water obtainable is the yellow, dirty water of the Yangtsze River, which is delivered in water carts at the residences. This is boiled or filtered, or both, and used for cooking and drinking purposes. Some few individuals have had wells sunk or bored to some depth below the surface water. An effort was made a few years ago to bore artesian wells in different parts of the city, and American machinery was brought out and looked after by an American superintendent, but, because of no previous geological examination, inadequate management, or some other reason, the attempt was a complete failure.

NEW BRIDGES FOR SHANGHAI SETTLEMENT.—Messrs. Howarth Erskine, Ltd., of Singapore, have secured a contract from the Shanghai Municipal Council to erect two new steel bridges at Shanghai at a cost of $220,000 Mexican currency. The municipality has decided to do away with the old and insecure wooden structures known as the Garden and Chekiang bridges and replace them with new steel structures. The new Garden Bridge will be a massive structure of ornamental design, in keeping with the artistic surroundings of The Bund, and will, when completed, consist of two spans of over 170′ each, with a main roadway of 40′ width along each side and a footway of 10′ width. Provision is made to run a double line of tram cars in the center of the main roadway, while the entire road surface will be paved with hardwood blocks. There will be over 860 tons of steelwork in this bridge before it is completed. The Chekiang Bridge is of the lenticular girder type, and is to have a span of 196′. It is also of massive construction to take the load of running tram cars as well as the pedestrian and heavy street traffic. The weight of the steelwork in this bridge will be over 360 tons. A feature in the erection of these bridges will be the method adopted in carrying on uninterruptedly the existing road and water-borne traffic, and this will be no small task when one considers the amounts there really are at these two points.

SHIPBUILDING AND GENERAL MARINE MATTERS

"AUSTRALIAN" A TOTAL LOSS.—The liner *Australian*, aground at Vashon Head, North Australia, has been abandoned as a total loss

JAPANESE DESTROYER "MINATSUKI."—The trial trip of the new Japanese destroyer *Minatsuki* was satisfactory. the vessel developing a speed of 29.95 knots per hour.

PROPOSALS FOR HULL, MANILA, P. I.—Sealed proposals in triplicate for the construction of one (1) hull for a stern paddle-wheel steamer will be received at the Office of Water Transportation, Quartermaster's Department, Manila, until 10 a. m., February 4th, 1907, and then opened. Blank forms and general description of the vessel will be furnished upon application to the officer in charge of water transportation, Manila. Envelopes containing proposals should be indorsed "Proposals for the Construction and Delivery of One Hull for Stern Paddle-Wheel Steamer, to be opened at 10 a. m., February 4th, 1907.," and addressed W. S. Scott, Captain, Quartermaster, U. S. A.

"WOOLING-MARU" IN SERVICE.—The new steel twin-screw steamer *Wooling-Maru*, built by the Kawasaki Dockyard Company, Ltd., of Kobé, to the order of the Konan Kisen Kaisha for service on the Hankow-Honan run, has been placed in commission. Her dimensions are as follows:—Length between perpendiculars, 228′ 8″; moulded breadth, 39′ 5″; moulded depth to main deck, 9′ 5″; draught (light), 4′; draught (loaded), 7′ bunker capacity, 120 tons cargo capacity, and about 600 tons on loaded draught. The gross tonnage is 1,458, registered tonnage 904, and the vessel has a speed of 13 knots. Particular attention has been paid to the needs of passengers, particularly Europeans.

JAVA-CHINA-JAPAN STEAMER "TJIKINI."—The steamer *Tjikini*, constructed for the Java, China and Japan Line, has been launched from the dockyard of the De Schelde Royal Company at Flushing. The ves-

sel has a length of 373', a width of 45' 5", and a depth of 30', with a loading capacity of 7,000 tons. It is principally destined for the cargo service, but has also accommodation for some first and second-class passengers, and for a larger number of other classes. Special installations have been made for quick loading and discharging. The engines are of the vertical triple compound system, with cylinders of 24¼, 40, and 67" diameter, and 48" revolutions, developing 1,700 h. p. with 70 r. p. m.

Launch of the Steamer "Perle"—The small French steamer *Perle*, being built to the order of M. Roque by the Hongkong and Whampoa Dock Company, through the agency of Messrs. Wilks & Jack, has been launched at Kowloon. When put in commission she will ply in the subsidized French mail service between Haiphong, Quan-Yen and Monkay, on the Saigon River, the service extending from the French city to the Chinese Frontier. She is built specially for the peculiar requirements of the service, and has but a draft of 2' so as to be able to go into the creeks and shallow parts of the river. Her principal dimensions are length, over all, 145'; breadth, 24', and depth, 5'. She will have cabin accommodation for thirty 1st and 2d class passengers, and is fitted with compound surface-condensing engines capable of driving her at a speed of 10 knots, and supplying electric light. The system of propulsion of stern-wheel. Four other similar steamers are included in the order for the *Perle*

Launches for Sale, Manila, P. I.—The Bureau of Navigation, Philippine Government, offers for sale the following property:—(*a*) The steam launch *Saisi*, a sea going launch 86' in length over all; beam 14' 5"; depth (moulded) 7' 6'; draft (loaded) 7'; draft (light) 6'; built at Hongkong in 1900. She is fitted with compound surface-condensing engine, with feed pumps and all necessary fittings attached, and is in first-class condition. Her boiler is of Scotch type, diameter 6' 6" × 8' 8", in first-class condition, with all necessary fittings. The hull is sound and strongly constructed, and shows no sign whatever of deterioration. This launch throughout is in excellent condition, and is ready to be put into commission at once. (*b*) The steam launch *Jolo*, a sea-going launch 65' in length over all; beam 11' 4"; depth (moulded) 5' 8"; draft 5'; built in 1890. She is fitted with compound surface-condensing engine, in good order, and a boiler of the Scotch type in fair condition. All fittings in engineroom are in good condition. This launch throughout is in fair condition and ready to be put into commission at once. (*c*) The steam launch *Suerte*, a river and harbor launch 61' 7" in length over all; beam 11'; draft 5'; tonnage 21.71 gross. She is fitted with compound non-condensing engine and Scotch boiler. Engine and boiler are in fair condition. This launch is ready to be put into commission at once. (*d*) Sealed bids will be received up to and including February 15th, 1907, and will be publicly opened at 4 p. m. on that day. The vessels may be inspected at Engineer Island, Manila, P. I. Further information will be given if application therefor is made to Frank P. Helm, Director of Navigation.

MINING, MINERALS AND THE METAL TRADES

Steelworks Equipment, Japan.—It having been found necessary to extend the Japanese Government Steelworks, a sum of $1,120 000 gold has been appropriated for expenditure during the current fiscal year. A further sum of $5,000 000 is needed, and when this sum is expended it is expected that the output of iron will be increased to 180,000 tons a year.

New Zealand's Mineral Wealth.—Gold to the amount of $325,000,000 has been taken from the earth in New Zealand during the past 50 years, and yet the surface of the gold-bearing deposits have comparatively been little worked. Great possibilities await further prospecting and mining combined with scientific methods. The coal mines of New Zealand produce excellent coal, and in close proximity are immense deposits of iron ore awaiting development.

Foreign Investors and Japanese Mines.—Although according to a consular report, there have been a great number of mines in Japan offered for the exploitation of foreign concerns, no deal has been made as yet. The great difficulty experienced up to the present in coming to terms between the parties was the fundamental change in the system of mining. A certain English syndicate, it is reported, has, however, decided to work two or three mines as soon as the engineers arrive in Japan this month.

Rise in the Price of Tin.—According to *The London & China Express*, it is a matter of common knowledge that the rise in the price of tin has been largely due to the falling off in the Straits supplies. Some of the bears of the metal have endeavored to make out that the decrease was not at all large; but official reports from the Federated Malay States show that in the first nine months of 1906 the export of tin, including metal contents of ore shipped, amounted to 608,381 piculs, as compared with 636,191 piculs in the corresponding period of 1905, and very much larger quantities previously.

Goldfields of Japan.—Mr. Frechville, a well-known mining engineer, who was sent out to Japan by a group of British capitalists to report upon the prospects of gold-mining in that Empire, reports that for the Japanese themselves Japanese goldfields present plenty of opportunity for profit, but that British companies would bankrupt themselves trying to pay expenses in mines which are yielding Japanese rich returns. There are largely ore bodies of a low grade character, and there is any quantity of cheap labor. Nevertheless, it does not appear that modern methods of working, which are scientific and expensive, are applicable.

North-Eastern Coal Mining Company, Japan.—This company, with a capital of -Y-2,000,000, will be established in the near future at Yumoto, Iwashiro Province. The mine, which covers an area of 2,500,000 *tsubo*, is said to contain no objectionable strata, and is full of rich veins of coal. The veins seem to grow thicker as one descends. One vein, which is 6' in width, is divided into two by rocks in the vicinity of Roto. At a depth of about 350' the thickness of the coal strata is more than 12' and the quality excellent. Though the quality of the mineral is inferior to that of Kyushu and Hokkaido coal, the low expense of mining it amply compensates, it is said, for this disadvantage.

Iron Furnace for Hokkaido.—The directors of the Hokkaido Tanko Railway Company are planning to erect an iron furnace after the purchase of the railroad by the Japanese Government. The coals of the company's mines are said to be well suited for the manufacture of iron, and as the locality extending from Poronai to Muroran abounds in iron sand, the quality of which has been ascertained to contain 80 to 90 per cent of pure iron, according to reliable authority, the scheme to set up an iron factory has been inaugurated. It has been known for some time that there are considerable deposits of iron sand along the coast of Volcano Bay in Hokkaido. It has now been ascertained that in all the rivers flowing into the bay there are also immense deposits of iron sank along the banks. The iron is free from sulphur and phosphorous impurities.

Australian Gold Yield.—The production of gold in the States of Australia and in New Zealand shows a slight decrease for the first six months of 1906:—

	First Half-Year 1905 Fine Oz.	First Half-Year 1906 Fine Oz.
Western Australia	965,372	904,861
Victoria	338,747	381,681
New South Wales	111,869	133,150
Queensland	290,478	251,986
New Zealand	238,085	252,001
Total	1,944,541	1,923,679

To which must be added the output of Tasmania, about 35,000 ounces.

FINANCIAL AND MISCELLANEOUS

Japanese Coal Refinery Company.—The Japanese Coal Refinery Company is about to increase its capital to -Y-2,000,000 with the extension of business in view.

New Anglo-Japanese Bank.—A newly-established Anglo-Japanese Bank has been granted official sanction by the Tokyo Government to open a branch office at Yokohama.

Agricultural Machinery for Manchuria.—Mr. Thomas Sammons, American Consul-General at New-chwang, writes that the beginning of the year 1907 will mark the introduction of steam plows and threshesr into Manchuria. Many native landowners are now interested in this subject, and if the pioneer farm implements prove successful an extensive trade will be developed.

Imperial Chinese Railways Sterling Loan.—Coupons of the Imperial Chinese Railways (Shanghai-Nanking line) 5 per cent Sterling Loan, due December 1st, 1906, are now being paid at the offices of the Hongkong and Shanghai Banking Corporation, 31 Lombard-st, London, E. C. When the Shanghai-Nanking Railway bonds were issued a few years ago at 97½, a profit-sharing note was given with every £100 bond. There is now a market for these certificates. They are quoted at £8, and Shanghai-Nanking Railway bonds (in certificates) are 103½, so that there is an excellent profit. There is a possibility of the £1,000,000, balance of the Shanghai-Nanking Railway loan being issued within the next half-year by the British and Chinese Corporation, though in this instance no profit-sharing certificates will be given with it.

Sawmill and Railway Machinery, Formosa.—The Formosan Government has granted an extensive concession to a Japanese company to cut the timber from an area of 25 square miles, containing more than 2,000,000,000,000'. About $2,000,000 gold capital will be invested, nearly three-fourths of which will be required for the construction of a railway, which will take three years. Then the company will locate a sawmill at Kagi. The first year's cutting will be about 16,000,000', which will be gradually increased to 25,000,000' annually. Manufacturers of logging equipment and sawmilling machinery wishing to supply the material for this undertaking should address the Fujitagumi, Osaka, Japan, and also the chief of the Industrial Department of the Formosan Government at Taihoku, Formosa, giving in each case a full description of the equipment they have to offer.

Japan's Railway Accounts.—The Railway Operating Bureau of the Japanese Government has just issued a statement of accounts covering the period from May 1st, 1905, to April 30th, 1906, inclusive, and following are the earnings of Government and private railways in yen:—

	1905-6.	1904-5.	*Increase.*
State Railways	21,056,140	21,406,137	2,650,003
Private Railways	44,977,025	37,538,711	7,438,314
Totals	69,033,165	58,944,848	10,088,317

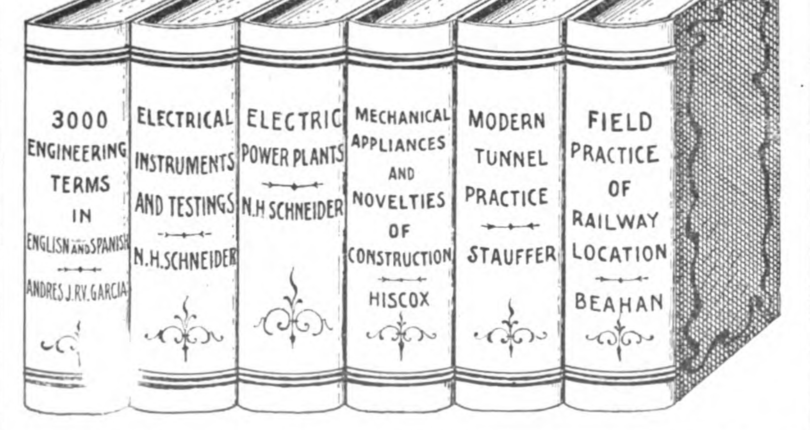
From this table it is seen that the earnings for the Government lines showed an increase of 12½ per cent in the 38th fiscal year as compared with the 37th, and that the increase in the case of private railways was 20 per cent, the combined increase being 17 per cent. The operating expenses were as follows, expressed in yen:—

	1905-6.	1904-5.	*Increase.*
State Railways	11,129,154	9,463,971	1,665,183
Private Railways	21,026,020	17,175,241	3,850,779
Totals	32,155,174	26,639,212	5,515,262

There was consequently an increase of 17½ per cent in the case of the Government lines and of 22½ per cent in that of the private lines, the increase over both being approximately 20 per cent. The net profits are shown in the following tables, amounts expressed in yen:—

	1905-6.	1904-5.	*Increase.*
State Railways	12,926,986	11,942,116	984,829
Private Railways	23,951,005	20,363,470	3,587,535
Totals	36,877,991	32,305,636	4,572,355

These results, stated with regard to the capital invested, show that the rate of profit in the case of the Government railways increased by 0.1 per cent, thus becoming 8.1 per cent for the year, while for the private lines the increase was 1 1 per cent, and the figures for the year became 9.5 per cent. Taking the grand aggregate, the increased rate of interest on invested capital was 0.7 per cent and the rate reached the fine figure of 9 per cent. This is considered a remarkable showing.



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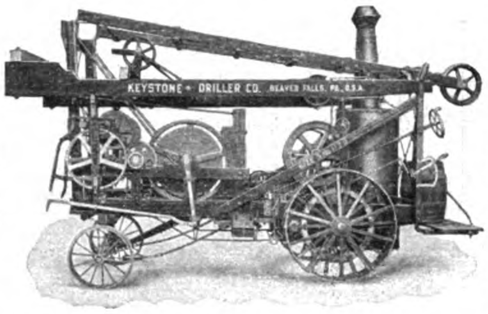

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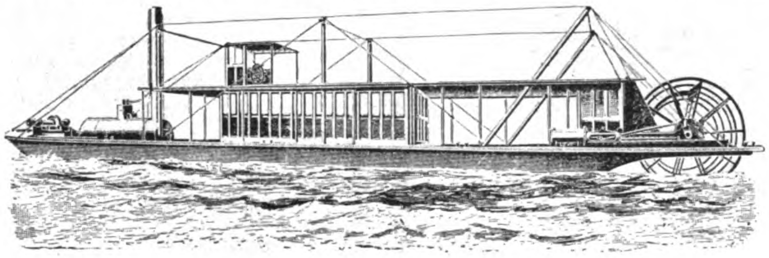

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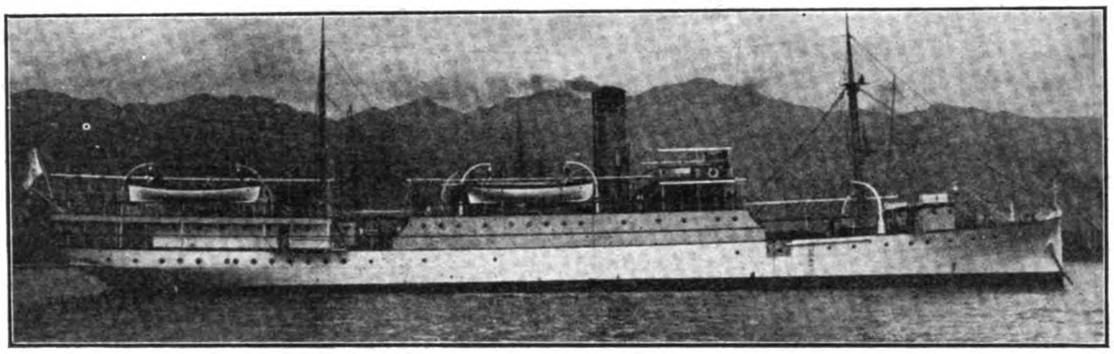

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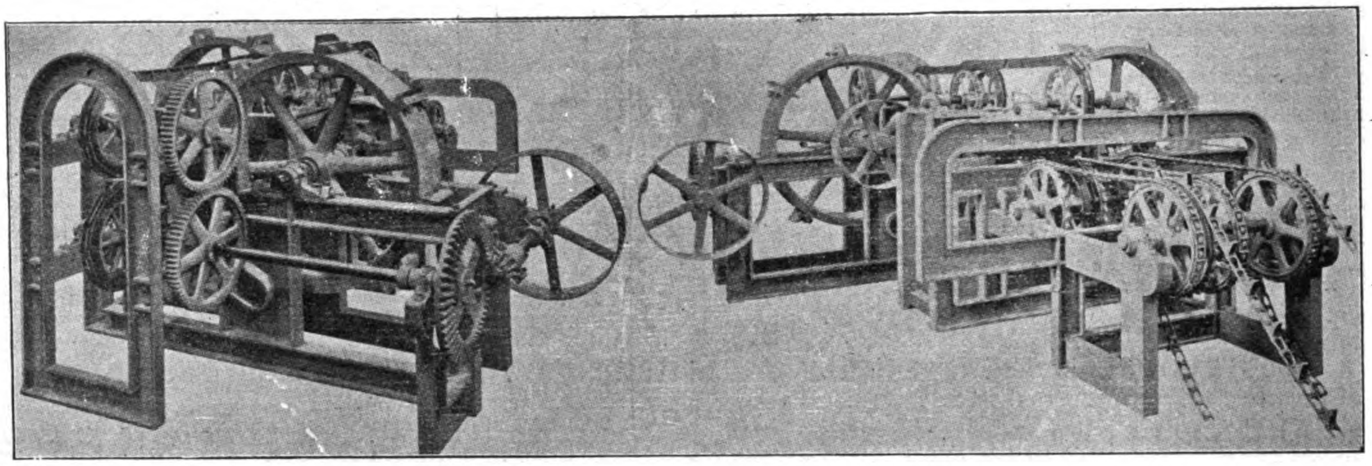

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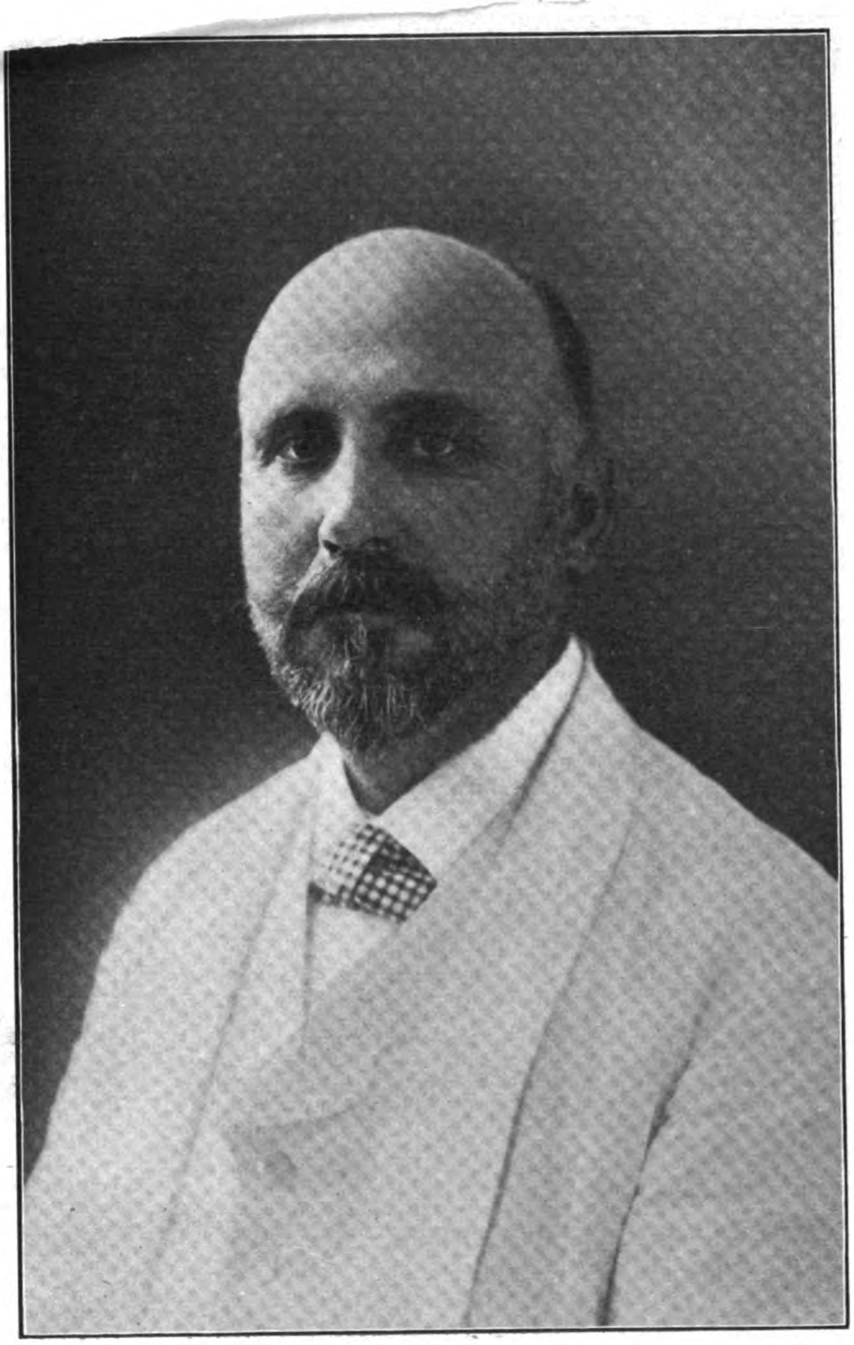

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MR. KOCH'S SECOND PAPER.

Owing to the late date on which Mr. Koch's second paper on reinforced concrete was received in this office, we regret our inability to publish it this month. It is a very instructive treatise on the practical design of arches, with notes on construction, and will appear in the March number of THE REVIEW.

VISAYAN RAILWAY CONTROVERSY

In another part of this issue we publish a digest of the report of Mr. F. A. Molitor, Supervising Railway Expert of the Philippine Government, in which he stated to the Governor-General his reasons for recommending disapproval by the latter official of the definite plans of location of 40 miles of railway in the islands of Cebú and Panay, submitted by the Chief Engineer of the contractors for the Philippine Railway Company. Mr. Molitor took the stand that in the submission of incomplete plans, specifications and profiles, the Chief Engineer had not complied with the requirements of the law, and he expressed the belief that Mr. Beard's estimate of the cost of construction ($47,473.03 gold per mile) was excessive. For these and other minor reasons he asked the Governor-General to disapprove.

With reference to the particular surveys under consideration, the Supervising Railway Expert affirmed that he had no fault to find with them in the main, and when the Chief Engineer for the contractors insisted that it was impossible for him at that time to submit complete plans and specifications of the entire construction, and that the delay caused by holding up the roadbed construction on that account would work a great hardship on the contractors, the Governor-General deemed it wise to approve the surveys and let the roadbed construction proceed. In approving of the surveys he made it clear that he was not approving of the estimated cost of construction per mile, handed in by the Chief Engineer, holding that the cost of the work was a matter that could be determined after its completion and the rendition of accounts by the contractors for Government audit. Mr. Molitor told the Governor-General that he thought the financial outlay should be restricted to $35,000 gold per mile, but the executive said that as matters stood he was not inclined to consider the question of cost.

Thus it came about that upon approving of the 40 miles of surveys submitted, the Governor-General organized a special auditing department to handle railway accounts. This department will pass upon the cost of surveys, labor, materials, construction, administration, inspection, and all other details of the railways to the smallest item, and if the elaborate system of audits is adopted by the Governor-General that has been submitted to him for approval we verily believe the intricacies of it will keep the administration of the railway people working overtime. The auditing department will be under the supervision of Mr. Kendall, Railroad Engineer in the Bureau of Public Works, who has been transferred to the Bureau of Audits of the Government for temporary duty in this connection.

On the whole we doubt very much whether railroad construction in the Visayan Group will prove as satisfactory to the contractors as it might have been had this first controversy never occurred. That the Governor-General's attitude throughout has been prompted by the sincerest of motives and an ardent desire to see the Visayan railroad construction pushed to completion with the least possible delay, has been clearly demonstrated by his impatience in getting the contractors started on this first 40 miles of line. Indications are that he has carefully safeguarded the Government's interests at the same time, although, from the standpoint of Mr. Molitor, it seems clear that the requirements of the law under which this construction is to be carried on have in several instances been ignored. Yet, as the Governor-General is a lawyer of no mean ability, no doubt he is the best person to determine whether or not his position is right.

Probably the most regrettable feature of this controversy is the resignation of Mr. Molitor. The record shows that he and the Governor-General were at cross-purposes almost from the beginning, and this being the case Mr Molitor concluded that his services could be of no further value to the Government. It appears that the Governor-General was slow to act upon Mr. Molitor's resignation, which he only accepted after telegraphic consultation with the Secretary of War.

Large quantities of construction material are now on the ground at Iloilo and Cebu and the construction of the 20 miles of line from the City of Cebu to Argao and the 20 miles from Iloilo to Pototan, for which the surveys have been approved, is progressing as satisfactorily as labor and other local conditions will guarantee.

RUBBER INDUSTRY OF THE EAST

The rubber industry shows unparalleled activity in the East at the present time. A noteworthy indication of its increasing importance in this part of the world was the recent successful rubber exhibition in Ceylon. The tea growers of that island discovered several years ago that this industry was proving far more profitable than their own, so some began to convert their plantations into rubber areas. Experiments also demonstrated the fact that the uplands of the island would produce certain species of rubber and bring immense returns, and they immediately began to extend the rubber-growing districts in that direction. Today Ceylon is a veritable forest of fine rubber trees.

When the results obtained in Ceylon became known the landholding interests in the Federated Malay States, in the Dutch East Indies, and in Borneo, turned their attention to the promotion of the industry in their respective localities. So successful has rubber-growing proven in these districts that in many localities in the Federated Malay States what had been dividend-earning tin-mining properties are being converted into rubber-growing enterprises with a confidence in better returns that shows wisdom. Today these properties are valuable rubber plantations. Numerous companies for the extension of the industry have been organized and more are being formed. The Mecca of much British capital is the Federated Malay States, and capitalists are sparing neither money nor physical effort to secure their place in the field. The soil of Malaya seems to be peculiarly adapted to rubber culture and indications are that before long this country will lead the industry in the East.

Experiments in rubber culture have demonstrated that certain parts of the Philippine Islands are well adapted to the industry, particularly the islands of the Moro Province which includes the great Island of Mindanao where rubber seems to flourish with particular avidity. Planters down there have taken up the industry with great enthusiasm. While it is yet in its extreme infancy there is very indication that the time is not far distant when rubber-growing will become a most important business with them. The Director of the Bureau of Forestry is an enthusiast over the possibilities for rubber in the southern islands and he promises that his bureau will do everything in its power to assist the planters in establishing rubber plantations. He announces that his bureau is ready to coöperate with these planters by way of giving advice and detailed information regarding the planting and growing of rubber, assisting them in securing seeds, and in a general way acting as their agent in Manila, as it were, to help them along. The foresters of the Government will be placed at the disposal of the planters whenever such assistance is requested, and the Bureau of Forestry will gladly make any legitimate demand upon it in this line its special business to the limit of its resources and experience. This seems to be a most liberal and praiseworthy proposition on the part of Major Ahern and we believe that when the intentions of the bureau become better known among the planters they will gladly take advantage of the offer.

RAILWAY CONSTRUCTION IN CHINA

During the last year the Chinese have taken a decided stand against foreign help in the construction of their railway. They have tabooed

the foreign engineer and the foreign capitalist. China for the Chinese and Chinese railways for the Chinese investor and engineer, have been so persistently advocated everywhere throughout the progressive communities of the Empire that, regardless of consequences, the foreigner and his money and genius are boycotted. We will not say that the principle involved is not a sane and a preservative principle, everything else being equal, but we have serious doubts of the ability of the Chinese to handle their own railway schemes successfully at this time. That gridironing their Empire with railways is the first wise step towards the development of its inestimable hidden wealth, must be conceded. Yet, by the announced anti-foreign policy in respect to this development we already see signs of enormous financial losses for the gentry through *graft* by the official clique, to say nothing of the greater losses that will result from bad engineering and worse construction which must of a certainty result from the inexperience of the Chinese in railway building.

The natives have innumerable railway schemes under way at present. The promoters are securing valuable rights from the Government, together with the material support of the latter for their schemes, and they are going broadcast among the gentry with their anti-foreign slogan and raising the funds for the construction of the lines. They are raising millions of dollars of capital among the masses, most of which will later on be squandered for lack of experience and to gratify the selfish ends of unscrupulous and crafty manipulators of the financial end of these companies. For the sake of the country's future, and in the interest of the people, we would like to see something encouraging in the situation as it presents itself today, but we can not. The present outlook portends nothing but ruin for the future of this engineering development.

The organization of one native railroad company reflects the organization of them all where the foreign influence is excluded. The promoters are generally the higher official class in combination with the wealthier and shrewder of the gentry. They go forth with the ever-popular anti-foreign campaign and arouse the gentry to a pitch where, before they think what they have done, they pour their gold into the treasury of the company, not realizing that this money has been donated to some unstable railroad project, but inflated with the idea that they are going to stamp out the foreign devil and exterminate his evil influence. When the company gets the control of the money there immediately begins a battle royal among the crafty promoters for its possession. What becomes of it then, or the greater part of it at least, is the same old story. Under the pretext of pushing surveys and the construction of lines, incompetent engineers are sent into the field to make a showing and this is sufficient to satisfy the gentry for the time being. In spite of the numerous all-Chinese railway projects which have had birth during the last two years we are unable to recall a single one that has not become embroiled over finances. It is true that some money has been expended to keep up the courage of the gentry investors, but further than the preliminary surveys few of the companies have gone. These surveys have proven to be most expensive and unsatisfactory, and for the most part what construction work has been done by the Chinese has been uncertain in stability and far distant from good, economical engineering practice.

It is not our desire to rail against the Chinese because they have barred the foreigner with his capital and his engineers from their railway enterprises, but we do believe that they are making a grave mistake in the policy they have adopted. With foreign capital judiciously negotiated and restricted and with the help and advice of foreign engineers of experience the situation may yet be saved; without these, never. Most of the foreign-built railroads of China are substantial lines, well-managed and safely conducted both for the people and the financial interests involved. Under foreign supervision the reckless expenditure of funds has been kept down to the minimum because the work of the engineer has been along those conservative lines which only large experience in railway construction and equipment can guarantee. We believe the time will come when the Chinese may be able economically to carry on their own railway construction, but that time is just now part of the dim and distant future. Unselfish administrative ability and competent engineering practice must first be drilled into the Chinese ere this condition can be hoped for.

And there is no objection to the Chinese raising money for the railroads and holding a majority or all of the stock in their own companies, but they must look to the foreigners for the administrative and engineering conduct of their projects if they ever hope to succeed in their important undertakings. Whether these foreigners be British, Belgian, French, German, American, or of any other nationality, is a matter of a little importance, but they are the only recourse for the Chinese to save the situation.

PHILIPPINE MINING AND MINERALS

In that section of his fifth annual report, just issued, which deals with the operations of the Division of Mines during the period under review, the Director of the Philippine Bureau of Science discusses the coal and other mineral resources of the Islands, which, he believes, are now on a fair way towards profitable development by the miner. For several months past the Division of Mines has been in a more or less disorganized state owing to the absence and final resignation of the Chief of the Division, Mr. H. D. McCaskey, and the lack of a sufficient number of operators to carry on the field work. A reorganization of the division is now being effected, which will include the employment of a larger operating staff, with a view to increasing the scope and volume of its work. This announcement will meet with the approval of the mining community and ought to give a pronounced impetus to the industry in general.

So far as is known at present, coal areas exist in Luzon, Batan, Polillo, Mindoro, Masbate, Negros, Cebú, Samar, Leyte, and Mindanao, and they promise to fill local needs in the future. The present wholesale price of Australian coal, laid down in Manila, is about ₱12.65, and the retail price about ₱16.50, these figures per ton of 2,000 lbs. Japanese coal is scarce on the local market owing to shortage in the stocks at home, but when the supply here is active the prices per ton of 2,000 lbs. are about the same as those which prevail for the Australian product. The lack of a cheap and good quality of coal is one of the greatest commercial obstacles we have to encounter in the Philippines, and, therefore, it has been the endeavor of the Division of Mines to push the study of the coal deposits as rapidly as its limited field staff could guarantee. A thorough study of the coalfields with a view to the most economic utilization of the grades of lignite and bituminous coal, and to their commercial importance is being carried on. Together with the promising deposits in Cebú, petroleum is known to exist near the town of Toledo, in that island, and in Tayabas Province. Since the insurrection, only limited explorations along this line have been made, but it is proposed to take up this question of mineral oil for careful and thorough investigation at a very early date. The analyses of the Compostela coal in Cebú have shown satisfactory gas-producing power.

The Division of Mines has succeeded in bringing out much important information regarding the mining operations for ore-bearing minerals in the Benguet country, and in the Mancayan-Suyoc region, while the mining field in Masbate has not been neglected. There are many other problems which have been undertaken but which have advanced slowly, owing to lack of numbers in the division. These questions include the investigation of limestones for economic purposes; of clays, building-stone deposits, rocks suitable for cement making, and of other materials which would be of value for structural purposes in the Philippine Islands; the investigation of the placer-mining industry and dredger ground in the provinces of Pampanga, Nueva Ecija, and Rizal; the placer mining fields of Pigtao and Misamis, Mindanao; the mineral resources of the Agusan River region in Surigao and Placer, Mindanao; the exploratory reconnoissance of the mineral resources of the Cagayan River Valley, etc. It is the intention of the division to push these explorations with much vigor in the near future. The Bureau of Science will hereafter publish all of its geological maps in a canvas-backed edition, in a form which will enable them conveniently to be handled. These will be placed on sale, together with a series of pamphlets covering matters of interest to the miners.

The asbestos deposits lying in Ilocos Norte along the flanks of the central mountain chain of Luzon and extending almost due north and south for a distance of about 30 miles, constitute a mineral deposit of much importance, and these deposits will soon receive their share of the division's attention. This occurrence was known to the Spaniards before American occupation. The asbestos is probably, in part, of the chrysotile variety; it occurs in veins in serpentine and in less completely altered peridotites, the veins being from 2 to 10" wide. The fiber is part silky and is from 1 to 8" long. Magnesite is also present in considerable quantities. This source of asbestos is sufficiently close to the sea to insure a fairly small outlay for transportation to points where coastwise steamers call, and labor, timber, and water are reported to be reasonably cheap. The economic geology of Ilocos Norte constitutes another important feature for future work which in time will need to be developed.

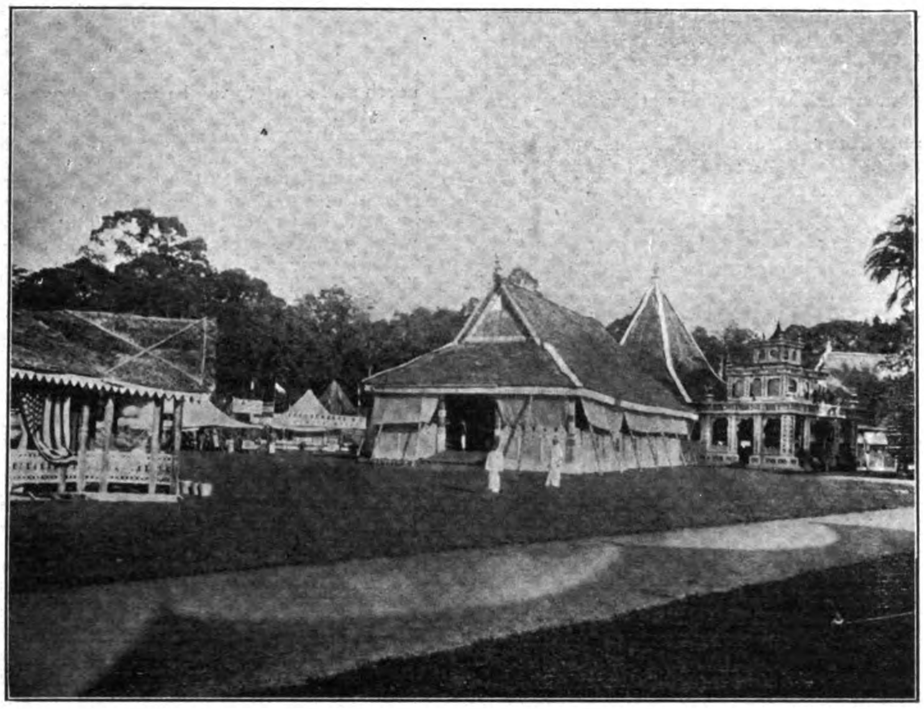
A series of studies on the volcanoes of the Islands is under way. As opportunity occurs the division will continue to gather material in this branch of geologic investigation until it is complete. An interesting description of the volcanoes might readily be prepared at the present time, but in respect to completeness this would be of little value. For example, the region covered by Taal Volcano, Island of Luzon, probably extends from the seashore at Batangas to Laguna de Bay. This area is a very large one and therefore any understanding of the life history of the volcano would involve a study of great magnitude, as an examination of the present crater readily reveals the fact that it is only an incident in the whole.

The important question of an adequate space for the mining division at the laboratories of the Bureau of Science and the fundamental importance of a place systematically to group and to begin the collection of specimens typifying the mineral resources of the Islands and the geologic and paleontologic material which is accumulating in the Division of Mines is one which the Philippine Commission should give immediate attention to. The initial cost of a wing to the building, the Director points out, would not be very great, and from a business standpoint it is believed that the loss due to inadequate quarters for the division and the inability properly to expand to meet future needs will far outweigh the interest and deterioration on a reasonable investment.

In commending the work done by the small staff of the Division of Mines during the last year, we believe especial praise is due to Mr. Warren D. Smith for his untiring and unremitting geological investigations. He has accomplished a wonderful amount of most valuable surveys and all of his reports on the results of his explorations have been of supreme merit. A. J. Eveland, M. E., also deserves mention for his valuable services to the Government, and it is a matter of keen regret on the part of the mining community that he has left the public service. Mr. Maurice Goodman, another geologist who has worked with Mr. Smith on many of the largest and most important surveys, is also a painstaking and thorough member of the field staff of the Division of Mines, and with a few more such men, under the direction of a competent and aggressive chief of division, the mining industry of the Islands and their mineral resources should develop with a rapidity that would bring probably immediate commercial returns.

REPORT ON THE RUBBER EXHIBITION AT PERADENIYA, CEYLON

[*Wallace I. Hutchinson, M. F., the Government Forester stationed at Zamboanga, Moro Province, attended the recent Ceylon Rubber Exhibition, held at Peradeniya, as delegate of the Philippine Bureau of Forestry, and has just made an interesting and instructive report covering the same to Major George P. Ahern, U. S. Army (retired), Director of the bureau. Mr. Hutchinson's observations cover quite thoroughly practically all phases of the rubber industry in the East represented at the exhibition. The wonderful strides this industry is making in this part of the world at the present time should command for the results of Mr. Hutchinson's visit to Ceylon general interest. We are indebted to Major Ahern for the use of photographs from which our illustrations are taken. They are part of a set which carried off First Prize at the exhibition.*—EDITOR'S NOTE.]



GENERAL VIEW OF THE RUBBER EXHIBITION BUILDINGS AT PERADENIYA, CEYLON

The Rubber Exhibition which was held at Peradeniya, Ceylon, September 13 to 27, 1906, was unique, not only in the annals of the Colony, but in the history of the rubber industry itself. It is a remarkable thing that within a few years of the commencement of the industry of rubber planting a special exhibition should be held, under Government auspices, for this planting product alone. The high importance of this industry, not only in its future value to the Orient, but in its immediate and future bearing on manufacturing enterprises, carried on in all countries and essential to civilized man at the present day, difficult to estimate. The Rubber Exhibition provided not only the best, but the first means by which the progress of the plantation rubber industry could be measured.

The exhibition was on a wide scale and of a representative character. That this was the prime object of its promoters is clearly shown in the circular letter sent to all parts of the world, which reads as follows:—

"It is hoped that the exhibition—the first of its kind ever held—will afford an opportunity for planters and manufacturers of rubber in all parts of the world to meet at Peradeniya for discussion, as well as for study, of the machinery and rubber exhibits to be collected here."

Ceylon naturally occupied the premier place in the number of exhibits, but the Malay Peninsula and India both sent representative collections of their rubber products.

Among the foreign exhibits deserving special mention was the fine collection of rubber samples from the various tropical countries, sent to Ceylon by Messrs. Figgis & Co., of London, and the map illustrating the centers of rubber production of the world by Mons. Van der Kerckhoven.

The Philippine exhibit, which was distinctly different from any other shown, attracted considerable attention and favorable comment.

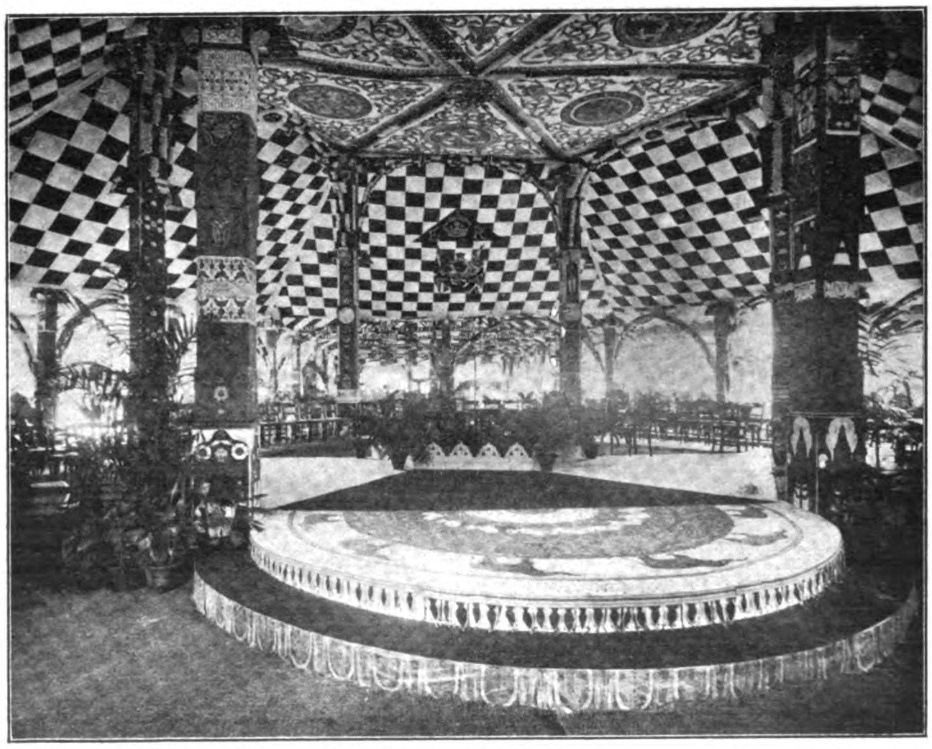
The exhibition was not only a benefit to planters, in that it worked out for them the science of rubber cultivation, but it also undoubtedly did much to encourage the industry throughout the countries in the Orient where the soil and climatic conditions are suitable for rubber growing.

Planters of the Colony and representatives from the various countries present at the exhibition, after viewing the tools and machinery invented for the extraction and preparation of rubber, could not but come to the inevitable conclusion that the old and crude methods of supplying the demands of the rubber market are doomed to failure when placed in competition with the new industry, systematically and scientifically conducted.

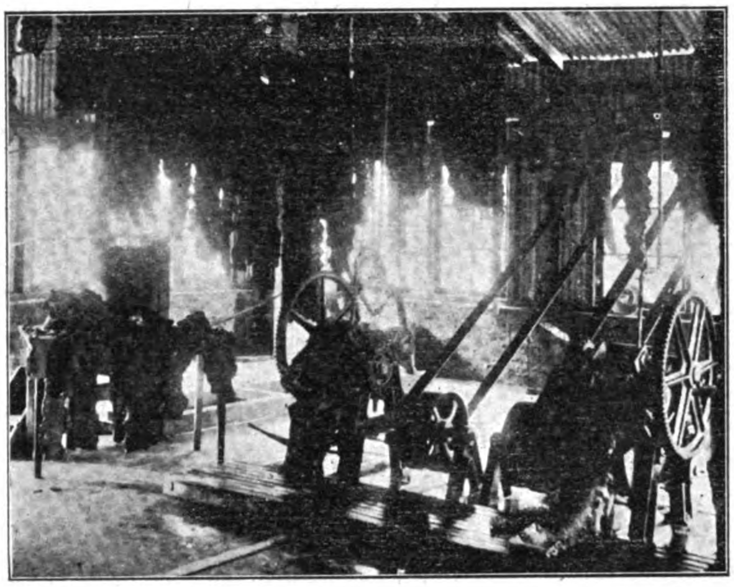
The meteoric rise of the rubber industry forms one of the remarkable chapters in the history of tropical agriculture. Twenty years ago rubber from *East of Suez* was an almost unknown commodity. Today thousands of tons are shipped annually from Ceylon, India and the Malay Peninsula to meet the demands for the product which has become a prime necessity of modern civilization. A few years ago it was found that the native rubber gatherers, who worked erratically and by the crudest methods in the great forest covered region draining the Amazon, could no longer supply the increasing demand for raw rubber. The solution of the problem, however, has been found in the systematic cultivation of rubber, and the building up of the industry in the healthier, more accessible parts of the East is undoubtedly an achievement worthy of note.

BUILDINGS AND EXHIBITS.—The site of the exhibition was the most central and appropriate that could be selected in Ceylon. The buildings were erected on the lawns in the center of the Royal Botanic Gardens at Peradeniya, surrounded by luxuriant tropical vegetation. The central exhibition building consisted of a main hexagon, with three wings which held the rubber exhibits, while numerous detached buildings, tents and *marquees* were used for machinery, exhibits of Kandayan arts and crafts, refreshment booths, etc. The interior of the main building was decorated with bunting, the pillars being hand-painted by Kandayan artists. The hexagon, in the center of which a fountain played, was used as a lecture-room, and it was here also that the opening ceremonies were held and the presentation of medals and awards made.

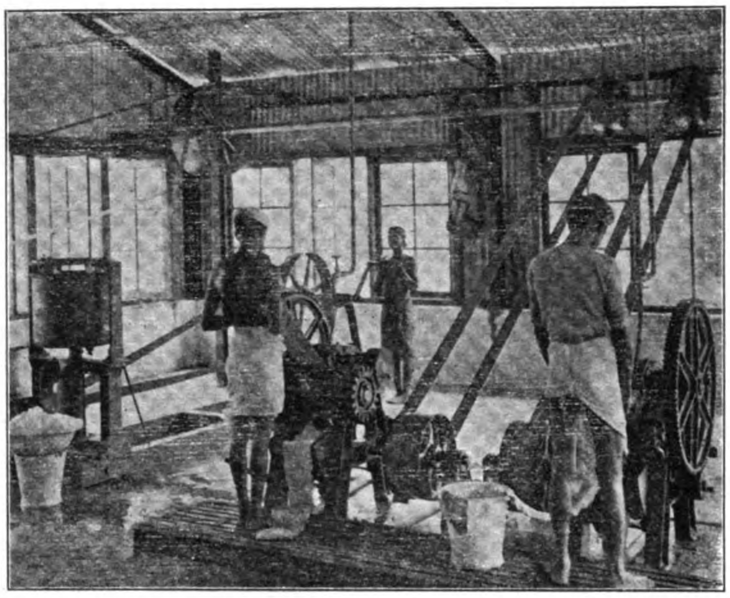
The Malay States and Straits exhibit occupied a large part of the right wing of the main building. Compared with the Malaya exhibit, Ceylon rubber made but a niggardly show. Most of the Federated Malay States and Straits Settlements exhibit had previously been shown at the Singapore Commercial Exhibition, where



HEXAGON OF THE MAIN BUILDING OF THE CEYLON RUBBER EXHIBITION; DECORATIONS OF THE CENTRAL CEILING, PILLARS AND FLOOR ARE FREE-HAND PAINTING BY KANDYAN ARTISTS



CEYLON RUBBER FACTORY.—MICHIE-GOLLEDGE COAGULATOR IN LEFT FOREGROUND, WASHING AND CREPING MACHINES IN RIGHT FOREGROUND; CREPE RUBBER HANGING FROM CEILING



CEYLON RUBBER FACTORY.—MICHIE-GOLLEDGE COAGULATOR ON LEFT WITH FRESHLY-COAGULATED RUBBER IN BASIN NEAR MACHINE; WASHING AND CREPING MACHINE IN RIGHT FOREGROUND SHOWING CREPE RUBBER

the minimum quantity necessary for a full exhibit was 28 lbs., while at the Ceylon Exhibition 5 lbs. was the minimum. Thus it was that in most cases the States exhibits were fine commercial samples, while those of Ceylon were strictly *exhibition samples.*

The most striking exhibit in the Malaya section was the Para crepe block rubber exhibited by the Lanadron Estate, F. M. S. The blocks, which were 1′ square and 6 to 8″ thick, weighed 25 lbs. The general method of preparation is as follows:—

The coagulated latex is passed through the crepe machine. The crepe is dried in a vacuum drier and the long strips folded to a uniform size and subjected to a hydraulic pressure of 250 tons or more, until they become compressed to the required size. The time required for the entire operation is about 8 hours.

Ceylon Para was also on exhibition in the right wing, together with rubber from India, principally Castilloa and Ceara of inferior quality.

The fine exhibit by Messrs. Figgis & Co., of London, of the rubbers of the world, was located in the north wing. One case contained the South and Central American products, and another the rubbers of the African Continent. From this exhibit, the planter unacquainted with wild rubbers could obtain an excellent idea of the nature of these products as compared with plantation rubber.

The following exhibits were also shown in the north wing:—

Indian Forestry Exhibit.
Ceylon Forestry Exhibit (350 specimens of wood).
Tires and rubber tools. Messrs. Walker Sons & Co., Ceylon.
Chemicals used in rubber coagulation. Messrs. Cargills, Ltd., Ceylon.
Vulcanized Rubber. Mr. M. Kelway Bamber, Ceylon.
Lace and Embroidery. Nuns of the Good Shepherd Convent.
Carved Woodwork. Kandy Industrial School.
Chemicals and Manure. Messrs. Frendenberg & Co., Ceylon.
"Michelin" Motor Tires, etc. G. O. S. Hodgson. Ceylon.
Philippine Islands Exhibit.
Rubber Exhibit, Culloden Estate. (Gold Medal St. Louis, 1904).
Photographs. By different estates and photographers.
Books, Pamphlets, etc. A. M. and J. Ferguson, Ceylon.
Map showing climate and rainfall of Ceylon.

The left wing contained exhibits of Ceylon Ceara and Castilloa, and a small portion of the Para entries, together with rubber tools and accessories of all descriptions, from tapping knives to a model vacuum drying house. Other products from Ceylon, largely agricultural, were also shown in this wing. The most important of these were the following:—

Agricultural Implements.
Cacao. (Pods of Caracas and Forastero and commercial samples of prepared chocolate).
Vanila Beans.
"Karakkan," (A dry-land grain.)
Manioc. (A catch crop).
Cinnamon. (Gold Medal, St. Louis, 1904).
Dye-bark.
Products of the Cocoanut Palm. (Desiccated cocoa nut and copra).
Palm Leaf and Fibre Baskets.
Sea Island Cotton.
Tobacco. (Prepared leaf, cigars, etc).

The machinery section had a special department to itself a short distance from the main building. Three engines, 8, 12 and 16 h. p., operated the machinery by means of a main shaft with the necessary pulleys and belts. The following machinery was installed in the building:—

2 Crepe Rubber Machines. Federated Engineering Co., Kuala Lumpur, F. M. S.
2 Reversible Barrels for Installing Bark Preparatory to Maceration. Messrs. Brown & Davidson, Ceylon.
1 Macerating Machine. Messrs. Brown & Davidson, Ceylon.
1 Combined Macerator and Crepe Rubber Machine. Messrs. Brown & Davidson, Ceylon.
1 Latex-Storing Tank. Messrs. Brown & Davidson, Ceylon.
1 Portable "Michie-Golledge" Coagulating Machine, Messrs. Walker & Sons Co., Ceylon.
1 Screw-Press for Blocking Rubber. Messrs. Brown & Davidson, Ceylon.
2 Rotary Strainers and Separators for Removing Impurities from Latex. C. O. Macadam; M. Kelway Bamber.
1 Latex Smoker. Messrs. Brown & Davidson, Ceylon.
1 Cotton Ginning Machine.
1 Citronella Oil-Press.

RAW RUBBER.—The uniform high standard of the samples of plantation rubber, and the variety of the tools, machinery and general planting accessories exhibited, shows the remarkable strides in the industry during the last few years.

Eastern crepe, sheet and block rubber is already far ahead of the so called *wild rubbers* produced by other countries in the form and condition in which the product is turned out, but elasticity and tensility, the paramount considerations in the eyes of the manufacturers, is still wanting. Para, hard and fine, when stretched and released, springs back instantly to its original shape and form. Plantation rubber, however, when stretched will not at once return to its original shape, but slowly resumes its form; this is its great fault. This fault no doubt is due to the treatment of the rubber. Time and experiment will probably find a solution to this problem.

Among the Ceylon rubbers especially worthy of note were the Para block and certain samples of Ceara. The rubber from this latter species was considered by the judges to be the finest at the exhibition. Also worthy of note was the crepe scrap and crepe bark scrap and flake block. Crepe scrap is the ordinary hand prepared scrap turned out through the washing and rolling machine, while crepe bark scrap is obtained from the tapping parings, and is usually of a darker color. Smoked Para in sheet, block and biscuit form attracted considerable attention. In this case, either the latex or the finished product may be smoked. Such smoking prevents tackiness or heating of the rubber on the surface.

Castilloa rubber is evidently not a favorite with eastern planters, as there were but two entries in this class.

MEDAL AWARDS.—Several Ceylon estates exhibited fine collections of rubber, that of the Culloden Estate, Neboda, deserving special mention. The exhibit consisted of the highest quality samples of block rubber, block from parings, flake block (smoked and unsmoked), scrap block, pressed crepe, finest crepe, smoked crepe, loose crepe, biscuits from 25 to 30 year old trees, tapping knives, comb prickers, collecting tins, Hevea seed and seed oil, etc. This exhibit was shown at the World's Fair at St. Louis (1904), winning the Gold Medal.

The Duckwari Estate showed Para rubber grown at high elevations, 2500 to 3000′, fine dark sheets; also amber biscuits and dark biscuits. This remarkable exhibit, which was awarded the Gold Medal for Para biscuits, caused no little surprise and interest among planters. Hevea had not been considered a high altitude tree up to this time. It is now thought that Hevea when planted at high elevations grows slowly, the bark taking longer to come to maturity, and for this reason gives a better quality of latex.

The Arapolakand Estate had an excellent case of block scrap, crepe bark scrap, smoked and unsmoked biscuits, dark, and pale, etc.

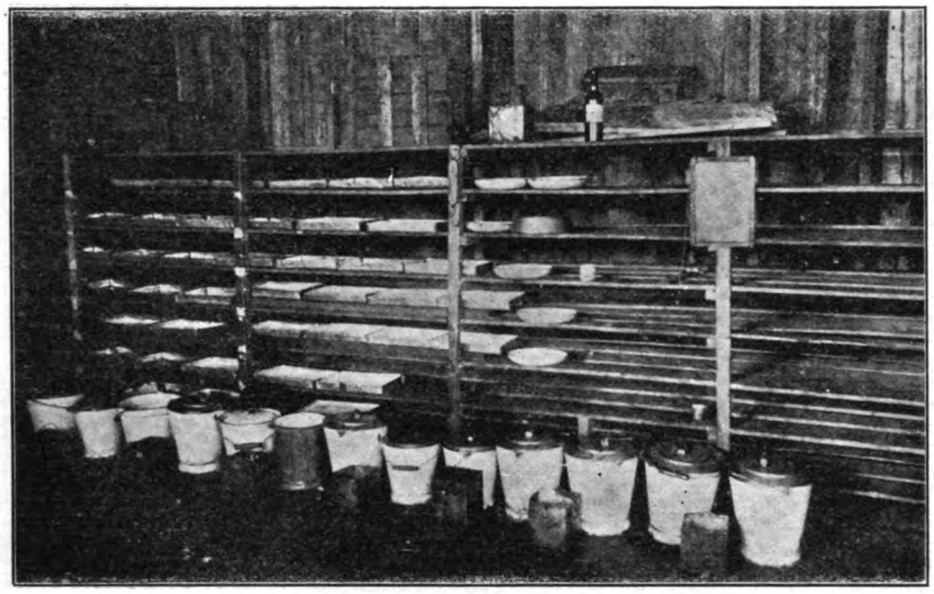
The best display of rubber was made by the Malay Peninsula—mainly due to the large quantity shown by each estate. Fine Para block rubber, washed and rolled crepe, large sheets, biscuits, blankets, *solution sheets*, etc., made a most comprehensive and excellent exhibit.

The Special Gold Medal for the best rubber from the Malay Peninsula was awarded to the Lanadron Estate, Muar, State of Johore.

There were but few entries in the Castilloa rubber class, the prize exhibit being a dark, black sample of block rubber from the Colloden Estate, Ceylon.

Ceara rubber class attracted only Ceylon exhibits, all of which were of fine quality. The lot which won the Gold Medal, and in competition with Para, received a Silver Medal in the class for the *best rubber at the exhibition*, was a number of large, thin sheets and biscuits from the Kondesalle Estate. The excellent showing of this rubber, and the good growth Ceara is known to make, will no doubt gain more attention for this species in the future.

The competition in the class of Rambong rubber was naturally confined entirely to the



CEYLON RUBBER FACTORY.—LATEX IN SETTLING OR COAGULATING PANS; TRANSPORT PAILS USED IN COLLECTING LATEX ON GROUND AT BOTTOM OF SHELVES

Malay Peninsula. The Gold Medal was awarded to an exhibit of crepe block shown by the Golden Hope Estate, Klang, Selangor, F. M. S.

Tapping knives, of which there were a large number on exhibition, may be roughly divided into two classes:—First, those adjustable to almost any degree; second, those fixed, and consequently not alterable by the tapping coolie. Paring knives and chisels of all descriptions were shown. The pricking tools were of two patterns, rotating ones, on the spur principle, and comb prickers. The latter style is considered with great favor by the Ceylon planters at the present time. It is a fact well worthy of note that the knives which received the highest awards were those belonging to Class 2 (unadjustable) mentioned above. Simplicity should be the key note in the invention of all instruments for cutting or paring, as a knife with a large number of adjustable parts is usually too complicated for the average coolie to comprehend. The knives receiving awards were all constructed with paring blade guards, to prevent deep cutting. Undoubtedly the best knife was that invented by W. T. Miller (awarded Gold Medal) which has no adjustable parts. The Bowman-Northway parer (awarded Gold Medal) has a detachable guard, which may be adjusted, however, without screws.

The best pricker (awarded Silver Medal) was that exhibited by C. C. Macadam, which was constructed on the comb pattern, with adjustable teeth. Bowman-Northway also showed a pricker (awarded Silver Medal) constructed on the spur pattern, with triangular guard.

General Observations.—*Rubber from macerated leaves, bark, etc.*—The extraction of rubber from the bark, twigs, leaves, etc., of Para, Ceara and Castilloa has been proven within the last few years to be a paying industry. At the present time there are in the East a number of estates which pay the total cost of tapping by the sale of rubber manufactured in this manner.

The macerating, washing and rolling operation, as carried on by the representative of Messrs. Brown and Davidson at the Ceylon Exhibition, is as follows:—

Dry bark, leaves and parings are placed in a large reversible barrel together with a quantity of water, in which the mass is allowed to soak, being frequently stirred, for 24 hours. At the completion of this time the *stuff* is taken out and passed through a compound macerating, washing and rolling machine. This machine consists of two revolving rollers, with a receiving trough beneath, upon which a constant stream of water is falling. The right hand portion of the rollers have spiral grooves cut along their length, and these rollers revolve, when the machine is working, at different rates of speed (20 and 12 r. p. m.), thus tearing up and grinding any material passing between them, all mechanical impurities being washed away through the fine sieve below. The mass is put through the machine repeatedly, until the rubber conglomerates in a lump. The left side rollers, revolving at the same rate, have circular grooves which do not have a tearing effect, but are intended for washing and creping the rubber. Two men are required to operate the machine. A ton of scrap yields approximately 7 per cent of rubber.

This machine will treat any tapping shavings and parings, dried bark, twigs and branches, as well as scrap rubber in any condition. It is thus adapted for the treatment of rubber vines, such as Landolphia, Clitandra, Parameria, etc., and would undoubtedly be suitable for the extraction of gutta percha. The extreme simplicity of construction, ease of working and combination of uses to which the machine may be put are especial points of advantage.

The cost of the combined macerating and washing machine is about ₱750 ($375 gold).

Handling and Packing Rubber Seeds for Export.—Para Rubber (*Hevea brasiliensis*).—The fruit of *Hevea brasiliensis* is a three-lobed capsule, containing three oval, brown speckled, shiny seeds. When unripe, the outer shell or capsule is perfectly green, but turns a brown color on maturity, at which time it splits and allows the seeds to fall to the ground.

The seeds are very perishable, and should be sown as soon after collecting as possible. If planting is unavoidably to be deferred for some time, they should be spread out on a cool, dry, cement or board floor, and thoroughly raked over frequently to prevent heating. If a large quantity of seed is to be stored for some length of time, it should be mixed with dry sand or charcoal and kept in a dry place protected from an excessive amount of sunlight.

For short journeys—a week or less—Para seeds may be sent in bulk through the mail without any packing, in a sack holding about 450 seeds and weighing 4 lbs. Where the seeds, will probably be en route for from 15 to 30 days, it is usual to adopt a method which will retard germination. In this case a packing box, 30×15×12″, which holds from 5000 to 6000 seeds, is used. A thin layer of dry charcoal and cocoanut fibre or sawdust is placed on the bottom, covered by a layer of paper, in order to prevent the dry compost sifting during transit; then a layer of seeds, more mixture, another layer of paper, and so on. Two parts sawdust to one of charcoal forms a suitable mixture.

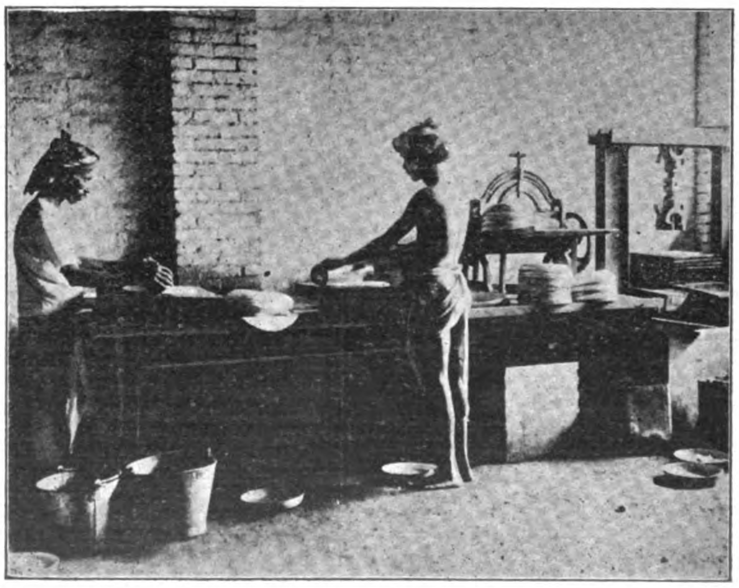
Another method is to pack the seed in sawdust alone, without the use of paper layers.

Excellent results have been attained by shippers in the Federated Malay States and Straits Settlements by packing Para seeds in boxes with damp powdered charcoal. Care is required in shipping by this method to get the charcoal moist all through, and neither too wet nor too dry.

For long distances a very satisfactory method of transportation is by Wardian cases. Instead of attempting to retard germination of the seeds, the object is to induce them to sprout, and with this end in view they are not packed but sown. If good healthy seeds are sown, germination should take place in about 10 days. En route to their destination, the seedlings may be tended in the box with the same degree of care that they would receive in the nursery bed, so that on arrival at their destination they should be good sized plants or stumps.

When it is desired to ship seeds by this method, the body of the Wardian case is filled to a depth of from 4 to 5″ with a light compost, consisting of leaf mould and sawdust in equal parts, or two parts leaf mould to one of decayed cocoanut dust, with a little charcoal; upon this is placed a layer of about 1000 seeds, a layer of compost one inch deep, and the whole mass well packed down. Bamboo twigs are then placed thinly on top of the earth, and narrow battens laid upon these, 6″ apart, being held in place by longitudinal strips nailed along the inside of the case on both sides. The twigs and battens are used to prevent the top soil from shifting during transit. The case is then set upon four bricks and the earth watered every morning and evening, ample drainage being secured through the cracks in the boards at the bottom.

It is the usual custom to germinate the seeds before shipping, the glass top-sides being left off until the last. These when screwed on admit sufficient light to allow the young plants



CEYLON RUBBER FACTORY.—ROLLING RUBBER BISCUITS

TAPPING PARA TREE, CEYLON.—FULL HERRINGBONE SYSTEM; DRIP TINS AT TOP OF CUTS; COLLECTING TINS ON GROUND; MAN ON RIGHT USING PARING KNIFE; MAN ON LEFT WATERING CUT SURFACE

to grow, while air is supplied by a ventilator at either end, which is covered with gauze wire, with a small box nailed on the inside so that the salt water cannot reach the plants. The percentage of germination by this method has been found, by actual experiment, to be between 95 and 98 per cent. The advantage of obtaining seedlings instead of seeds is that a year is gained in the planting operation.

Wardian cases cost in Colombo, Ceylon, Re. 15 (₱10). Cases planted with 1000 seeds and ready for shipment Re. 20 (₱13.35).

CEARA RUBBER (*Manihot glaziovii*).—The seeds of Ceara are enclosed in a capsule, containing three seeds which, when ripe, splits and scatters the contents. The seeds, which are of small size, have a little caruncle or wart at one end, and it is from this that the root emerges upon germination. The outer shell of the seed is very hard and unless the caruncle is filed with a rasp almost through to the fleshy part of the seed, germination may not take place for some considerable time.

On account of this slow power of germination, without treatment seeds may be shipped long distances by packing in sawdust or charcoal. The percentage of germination of Ceara seeds received in Zamboanga, Mindanao, P. I., from Ceylon averaged 75 per cent, seeds planted at stake. From two weeks to a month is required to make the journey from Ceylon to the Island of Mindanao, the time depending on the steamer, route, etc. Ceara seeds may be kept for several months by placing them in a dry, cool place, somewhat darkened.

CASTILLOA RUBBER (*Castilloa elastica*).—The somewhat fleshy fruit of Castilloa contains numerous small seeds, with a white papery coat, about ¼″ in diameter. Owing to the variable size, the number required to make a pound ranges from 800 to 1000. The seeds are very perishable if not removed from their fleshy covering and cleaned of all pulp as soon as picked.

Shipping may safely be done by packing the seeds in charcoal or sawdust. If it is desired to keep them for several months prior to planting, they should be placed in a dry, cool room, and frequently stirred to prevent heating.

The Wardian case, already described, is adapted to the shipment of seedlings of all the species of rubber mentioned.

MONTHS OF DELIVERY OF RUBBER SEEDS.—Para (*Hevea brasiliensis*), May and June, October and November; Castilloa (*Castilloa elastica*), May and November; Ceara (*Manihot glaziovii*), available all the year.

Orders should be booked from 4 to 6 months ahead of the time of delivery. Following is a list of rubber seed dealers:—I. O. Macgregor, Seremban, Federated Malay States, (Para per 1000, ₱6 to ₱7); Director Botanic Gardens, Singapore, Straits Settlements, (Para rubber); J. P. Richards, Heneratgoda, Ceylon, (Para, Ceara, Castilloa. Germination guaranteed); J. P. Williams & Co., Heneratgoda, Ceylon, (Para, Ceara, Castilloa); Manager, Culloden Estate, Neboda, Ceylon, (Para rubber); J. D. Pereira, Orchard Row, Singapore, Straits Settlements.

CLIMATE AND SOIL REQUIREMENTS OF RUBBER TREES.—The best estimate of the soil and climatic conditions essential to rubber cultivation may undoubtedly be obtained by a consideration of these factors in countries where the various rubber producing species have already been grown with success.

PARA RUBBER (*Hevea brasiliensis*).—The Amazon rubber district, from which wild Para is obtained, extends over a vast area to the south and west of the Amazon River in South America. The climate of this region is noted for its uniformity, the mean annual temperature being 81° (Fahrenheit), with a maximum temperature of 95° F. at midday and a minimum of 74° F. at night. The mean annual rainfall of the district varies from 80 to 120″. From January to June is the rainy season, frequent showers, however, occurring during the remainder of the year.

In Ceylon and the Malay Peninsula, where Para is an introduced species, it grows well up to 10° north latitude. Many planters and rubber specialists claim that north of this point Para trees cannot be grown profitably on a commercial scale. This supposition, however, still remains to be proven, but if it be true, then there is but a small area of the Philippine Islands, north of the Island of Mindanao, where Para rubber may be cultivated.

Para has been grown successfully in Ceylon up to 3000′ above the sea. The mean annual temperature of the rubber district of the Colony varies from 70 to 80° F., and the mean annual rainfall from 75 to 160″.

It has been found in Ceylon that Para may be cultivated with success on soils relatively poor in chemical properties. The organic matter and combined water in these soils usually varies from 2 per cent to 30 per cent, potash from 3 per cent to 4 per cent, phosphoric acid from .01 to .10 per cent, and nitrogen from .10 to .50 per cent. Alluvial and forest soils are usually well suited for rubber growing. Stiff soils should be avoided. Swamp areas which have been effectively drained and made sweet by the application of lime, or burning, may also be utilized.

In the Federated Malay States, where the general mean temperature is 80° F., Para has been grown up to 2500′. The annual rainfall of the rubber district is 80″, although close to the high mountains 50 per cent excess of this amount is often registered.

The low-lying land at the foot of the mountains is composed of deep alluvial soil, the organic matter in which frequently exceeds 30 per cent, and the nitrogen .90 per cent. Other alluvial soils considered suitable for Para are formed from limestone, sandstone and granite.

The ideal soil for Para is that of low, alluvial flats full of decayed vegetable matter, where the temperature is between 74 and 94° F., and the rainfall from 80 to 150″.

CEARA RUBBER (*Manihot glaziovii*).—Ceara rubber in its native province of Ceara, Brazil, grows in a gravelly or sandy soil. The mean, annual rainfall of this region is approximately 75″, and the mean annual temperature 72° F.

In Ceylon this species grows luxuriantly in the low hill district up to 3000′ elevation, and it is also said to thrive, when properly started, in the dry regions of the north and east of the island, where the rainfall averages only 50″ a year. Throughout the Para district small clumps of Ceara may be seen around almost every native house; the tree is also used extensively for hedges.

In the Island of Basilan, Moro Province, P. I., Ceara has made a remarkable growth on alluvial forest soil, at 1000′ above the sea, where the mean annual rainfall is 70.″

Ceara is said to be especially adapted to dry, sandy situations, and will stand drought well.

CASTILLOA RUBBER (*Castilloa elastica*).—Castilloa elastica is found growing wild in Mexico and throughout the Central American States. In its native habitat, the tree flourishes in a warm, moist climate, with abundant rainfall, and is rarely found above 1500′ elevation. It requires a deep, loamy soil, such as is found in valleys or on low ridges, but does not thrive on swampy ground or where the drainage is poor.

In Ceylon it has been found that Castilloa makes a poor growth on shallow, ill drained soils, but that it will grow well in a rich, loamy soil, with good drainage. The maximum elevation for planting varies from 1000 to 1500′.

In Mexico it is said to succeed best in deep, alluvial soil, somewhat sandy but not too dry. The soil should be well drained, but have sufficient underground moisture to enable the tree to withstand drought. The mean annual temperature should not be below 76° F. Five hundred feet is given as the maximum elevation for planting, it being reported that the tree does not produce latex in paying quantities at higher altitudes.

COST OF CLEARING LAND, PLANTING RUBBER, ETC. IN CEYLON.

Peradeniya District.

	1st year.	*2nd year.*
Felling and clearing	*Re. 12.00	Re. ....
Lining and pegging	2.00	....
Holing	6.00	....
Filling and Planting	3.00	....
Plants	1.50	.50
Weeding	10.00	9.50
TOTAL	Re. 34.50	Re. 10.00
	₱ 23.00	₱ 5.66

*NOTE:—3 rupees equal $1 gold.

Ambalangoda District.

	1st year.	*2nd year.*
Felling and clearing	Re. 10.00	Re. ....
Lining and pegging	2.00	....
Holing	9.00	....
Filling and planting	7.00	....
Plants	1.50	....
Weeding	12.00	12.00
TOTAL	Re. 41.50	Re. 12.00
	₱ 27 66	₱ 8.34

TAPPING PARA TREE, CEYLON.—COLLECTING CUPS ATTACHED TO TREE CATCH ALL THE LATEX AND ARE THE UNIVERSAL SYSTEM IN USE IN RUBBER GROWING COUNTRIES OF THE WORLD

TAPPING PARA TREE, CEYLON.—USING A BOWMAN-NORTHWAY SPUR PRICKER TO OPEN LATEX TUBES IN WOUND OF A TREE WITHOUT REMOVAL OF ANY OF THE CORTICAL TISSUE

Ambalangoda District (Low-land).

	1st year.	2nd year.
Felling and clearing	Re. 8.00	Re. ......
Lining (20×20′)	1.50	......
Holing (2×2×2′) and filling in	9.00	......
Plants per 1000	2.00	......
Planting	1.00	......
Weeding	18.00	12.00
TOTAL	Re. 39.50 ₱ 26.34	Re. 12.00 ₱ 8.00

Kalutara District (Low country, jungle land.)

	1st year.	2nd year.
Felling and clearing	Re. 8.00	Re. ......
Lining and pegging	2.00	......
Holing and filling	5.00	......
Plants	4.00	......
Planting	1.00	2.00
Weeding	18.00	16.00
TOTAL	Re. 38.00 ₱ 25.32	Re. 18.00 ₱ 12.00

Peradeniya District.

	1st year.	2nd year.
Felling and clearing	Re. 12.00	Re. ......
Lining and pegging	2.00	......
Holing	6.00	......
Filling and planting	3.00	......
Plants	1.50	2.00
Weeding	18.00	16.00
TOTAL	Re. 42.50 ₱ 28.34	Re. 18.00 ₱ 12.00

COST OF LABOR.—In an estimate of the cost of opening land in a central province in India, by Francis J. Holloway, the following statement is made:—"In some districts the coolie is paid 33 cents per day; in others 50 cents."

Number of trees per acre at different distances.

DISTANCE OF TREES IN FEET.	NUMBER OF TREES TO THE ACRE.
10×10	435
10×15	290
15×15	193
18×18	134
20×15	112

CULTIVATION OF RUBBER TREES.—If the planter desires to raise his own seedlings, a good piece of flat land, with water at hand, should be selected for the nursery site. The ground should be ploughed to the depth of a foot or more, the stones and roots removed, and the lumps of soil broken up. The plot should then be divided into beds 4′ in width, built up 12 to 18″ above the level of the ground, and smoothed off ready for planting. If the soil is poor, cattle manure or leaf mould may be added before sowing the seed.

From experiments made at the Botanic Gardens, Singapore, it was found that cow-dung was by far the best manure for seed beds, burnt earth and leaves coming next, while lime appeared to injure the young plants.

A temporary shelter should be constructed over the nursery beds by setting posts 8′ high in lines 10′ apart, and placing upon these cross bars sufficiently strong to support a layer of palm leaves, brush or matting, etc. If the seeds are planted in bamboo pots, the construction of the seed beds is unnecessary, the pots being placed on the ground under the shade frame. Where stumps are planted, bamboo pots are rarely used. A bamboo fence should also be constructed around the seed beds in order to keep out hogs and other wild animals.

Where seed has been delayed for some length of time in transit, it is advantageous to make a sprout test before planting. This may be carried on in the following manner:—

Erect a platform a few feet above the ground, and upon this stretch sacking or coir matting. On the matting place a little powdered charcoal to aid in retaining moisture. Place the seeds on the charcoal and cover them with more matting, water occasionally to keep the whole damp. Examine the seeds every day, and as soon as any show signs of germination, remove them and plant in pots or in the seed bed.

In large planting operations, seeds are often sown broadcast in the beds or planted out at stake. The usual method of planting, however, is to set them every 6″ in rows 6″ apart in seed beds. A small pointed stick may be used in making the holes for the seeds, which should be placed on their side and covered with soil to a depth of from one-half to one inch.

Para and Castilloa seeds are usually sown in nursery beds. Ceara seed, which—on account of its hard coat—requires filing at the caruncle end before planting, is in many cases set at stake in the permanent plantation.

After the seeds are planted, the nursery beds should be watered twice daily, in the morning and at night. Shade is required during the first month, but after that time it should be gradually removed. Plants two months old grow well in the open sunshine.

Para seed germinates in 10 or 15 days, Ceara in 20 days, and Castilloa in 3 weeks.

The seedlings may be set out when from 15 to 24″ in height in the permanent plantation, in holes 1½×2×2′. The soil of the prepared hole, which, if young plants are used, is filled in, should be slightly tramped down, and then a stake, several inches in diameter and 3′ long, forced into the center and worked around; the seedling put in carefully to the same depth that it was in the nursery and the soil pressed against the tap root by pushing the stick into the earth, somewhat at an angle, a few inches from the plant, pressing towards it and tramping around with the foot. Care should be taken to put the tap root in straight, not curled up, and to tramp the earth firmly around the roots. Planting should be done, if possible, at the beginning of the rainy season.

The plantation should be cultivated about once a month for the first two years in order to keep the weeds down. In newly cleared forest land, where it is impossible to use a cultivator, an area 4 to 6′ in diameter should be cleared of weeds with a hoe around each tree.

Close planting is no longer in favor in the East. The distance at present recommended in Ceylon and the Federated Malay States is 20×15.′ It was thought at one time that the best method of procedure was to plant 10×10′ or 12×12′ thinning out the extra and undesirable trees at the end of the fourth year. It has been lately proven, however, that by this method the growth of the whole plantation is retarded approximately one year, and that four year old trees (Para) do not yield a sufficiently good quality of rubber to pay for the extra expense incurred under this system.

If it is found necessary to keep the plants in nursery beds for six months or more, it is best to cut all the seedlings back to about 18 or 20″, when they reach a height of from 3 to 4.′ If planting is done in moderately dry weather, it is advisable to stump the seedlings, which process will aid the plant in withstanding drought. The seedlings should be cut back, as stated above, and all broken roots trimmed off above the injury before planting.

The land for the permanent plantation should be cleared thoroughly and as many tree stumps as possible either removed or burned. It has been found in Ceylon and the Federated Malay States that a fungus (*Formes semitostus*), which is especially harmful to Para rubber, is developed on jungle stumps and from these spreads to the rubber trees. If the area has previously been cleared, it should be well ploughed and disked before planting operations are begun.

Large plantations should be broken up into blocks by belts, 20′ wide, of jungle or cultivated trees. These belts will not only serve as a protection to the trees against heavy winds, but will also prevent the spread of injurious insects and fungi. Dapdap and Albizzia trees may be used to advantage both for windbreaks and also as shade trees for Para in sections subject to long dry spells. The shading of rubber, however, is of minor importance in the tropics, owing to the absence of severe droughts. Para usually makes a better growth if given a light shade during the first and second years, but after this period shade is not necessary.

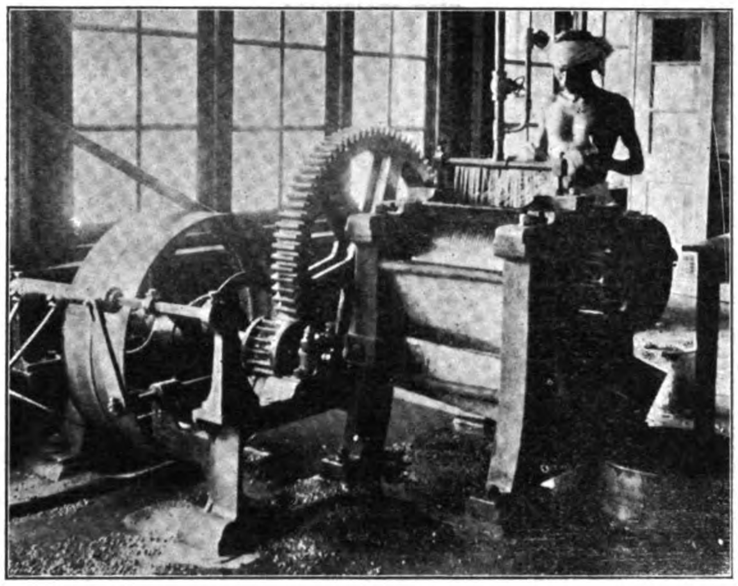
Dapdap may be propagated by planting cuttings between every two rubber trees. The best results are obtained from cuttings several feet in length and between 1 and 2″ in diameter planted a foot deep.

Albizzia trees are more difficult to start from cuttings, and do not produce such an abundance of plant food as Dapdap, although they are very rapid growers.

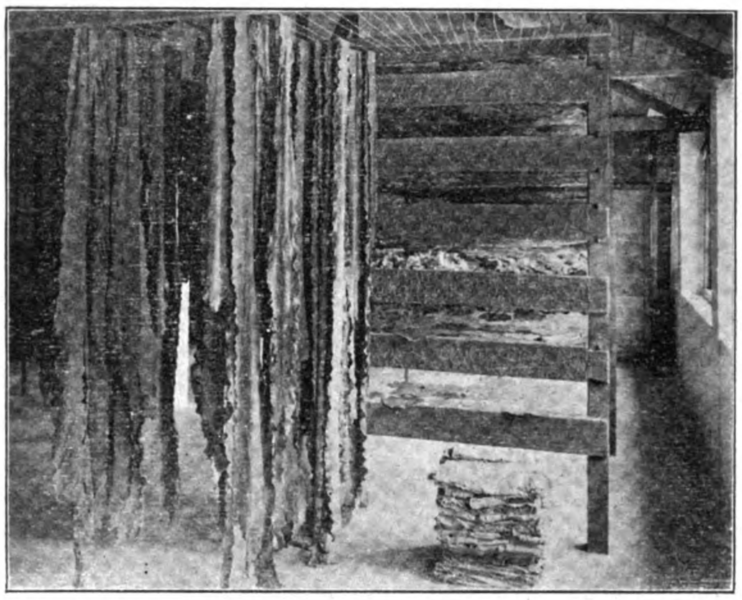
Para, Ceara and Castilloa should be pruned by removing the terminal bud with a knife or the thumb-nail when the trees are 10 to 12′ in height. This will prevent them growing tall and slender and will also give an increase in circumference, which will allow the trees to be tapped at an earlier period. If the terminal and lateral branch buds are repeatedly removed, the result will be a tree with a short bole, considerably forked, and supplied with an abundance of foliage. As tapping is rarely done above 6,′ this is the ideal form of tree sought after.

The manuring of rubber trees is carried on from the time the plants are 6 months old. The main object of this operation is to increase the cortical tissues of the stem from which the latex is obtained. Taking Para as an example, we may say that the rootlets grow radially from 10 to 15″ or more per year, depending on the soil, situation, etc. The manure should be distributed in such a manner that it will be of the greatest benefit to these rootlets,

TAPPING PARA TREE, CEYLON.—FULL SPIRAL SYSTEM OF TAPPING; COOLIE PARING BARK WITH A GOLLEDGE KNIFE



CEYLON RUBBER FACTORY.—WASHING MACHINE; RUBBER PASSES THROUGH TWO GROOVED ROLLERS REVOLVING AT DIFFERENT RATES OF SPEED, UPON WHICH A STREAM OF WATER IS CONSTANTLY PLAYING



CEYLON RUBBER FACTORY.—DRYING ROOM; CREPE RUBBER TO LEFT; BISCUITS ON LOWER TWO SHELVES; CREPE FOLDED READY TO BE PRESSED INTO BLOCKS, ON FLOOR; FLAKE RUBBER ON UPPER THIRD SHELF

which are the feeders of the tree. When soluble manures, such as sodium and potassium nitrates, sulphates, etc., are used, they should be mixed with dry earth and forked in over the area covered by the young rootlets. If cattle manure or leaf mould is used, however, it is customary to dig a wide trench a foot or more deep, mixing the manure with the soil just within reach of the newly formed rootlets. When the root systems of adjacent trees have met, the manure may be broadcasted between the rows and the ground well forked.

Many planters object to trench manuring, claiming that it is impossible not to injure the newly formed roots. In such cases, green soiling with herbaceous plants is recommended, as these may be cut, thrown on the ground and allowed to decay without forking the soil. Such species as *Crotalaria striata D. C.*, *Crotalaria laburnifolia L.*, *Crotalaria incana L.*, *Cajanus indicus Sprong*, etc., may be used for this purpose. These plants give a good soil cover, keeping the weeds in check, and also produce a large amount of plant food. As many of these species are shrubby, they will stand pruning about three times a year. Planting may be done by casting from 10 to 20 lbs. of seed broadcast per acre among the rubber trees. Besides shrubs, certain trees, such as Dapdap (*Erythrina sp.*) and Albizzia moluccana, are often used for green manuring. After they have become properly started, the trees should be pruned every month and the leaves and branches allowed to rot on the ground.

With rubber planted at a distance of 20×15′, it is often desirable to have an inter or catch crop. Cassava, bananas, cacao, coffee, pepper, tobacco and cotton are the products most used under such conditions. Hemp is also being tried at the present time as a catch crop with Para rubber, at the San Ramon Farm, Moro Province, P. I., but it is too early as yet to determine whether it is a suitable inter crop or not. From the graphic representation of the root system of Para, Castilloa and Abacá, it would seem that these species could be successfully grown together for a few years at least. Rubber trees have a rapid growing, compact root system, which allows the profitable cultivation of catch crops for about four years.

Several noted estates in the Federated Malay States have practically paid all working expenses by cultivating cassava, as a catch crop for the first four years, with rubber. On the other hand, there are a number of cases on record in the Malay Peninsula where tapioca and rubber planted together have resulted in a very poor growth of the latter species. Tapioca is considered by many as a very exhaustive crop. Without doubt a considerable quantity of plant food is removed from the soil when the roots are dug out, but the injurious effect could undoubtedly be minimized by wide planting of the rubber trees, the cassava being confined to a limited area in the center of the rows. With rubber planted 15×15′ and cassava 6′ apart between the rows, the first crop will be ready to harvest in about 18 months, and the second crop at the end of the fourth year.

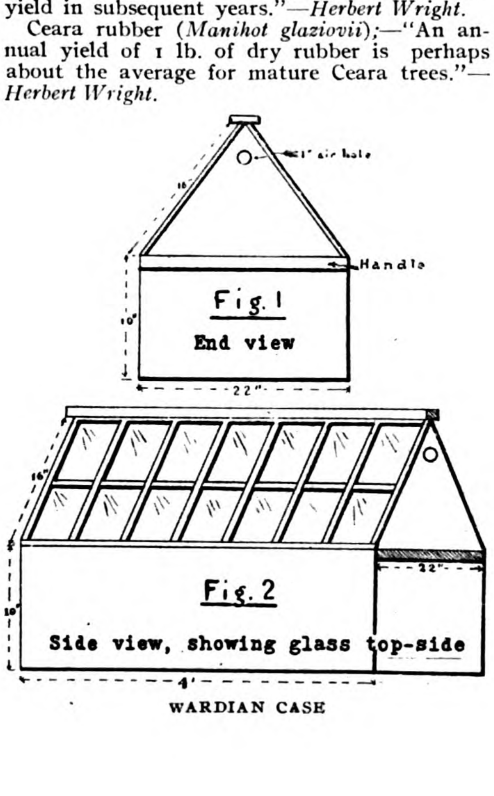
Cacao and coffee planted with rubber, in the middle of the lines, 10 to 20′ apart, will last for several years. The protection which the rubber trees afford cacao against drought makes these species especially adapted to be grown together.

Cocoanuts grown with rubber do not do well on account of the rapid growing root system of both species.

ANNUAL YIELD OF RUBBER.—The annual yield of the different rubber producing species is in general as follows:—

Para rubber (*Hevea brasiliensis*);—"Trees from 4 to 6 years old, having a minimum circumference of 20″, may be expected to yield an average of 1 to 3 lbs. of dry rubber per tree each year up to the 10th year, and a higher yield in subsequent years."—*Herbert Wright.*

Ceara rubber (*Manihot glaziovii*);—"An annual yield of 1 lb. of dry rubber is perhaps about the average for mature Ceara trees."—*Herbert Wright.*



WARDIAN CASE

Castilloa rubber (*Castilloa elastica*);—Mature trees, 7 years or over, yield annually from ½ to 1 lb. of rubber. Old trees, 25 years, yield 3 lbs. or more per year.

COMPARISON OF COMMERCIAL VALUE OF DIFFERENT RUBBERS.—Para, Ceara and Castilloa all yield rubber possessing a high percentage of caoutchouc, the component on which the real value largely depends. In Ceylon, Para prepared in the ordinary way possesses from 90 to 95 per cent of caoutchouc, the samples of Ceara and Castilloa have from 75 to 90 per cent.

In view of the present boom in rubber in Ceylon, the Federated Malay States, Straits Settlements, Java, Borneo and India, the question is often asked as to which is the best species to cultivate. In Ceylon, the chief center of plantation rubber at the present time, it is considered by those who are vitally interested in the industry that where Para rubber will grow it can be cultivated as the mainstay of the estate. Para rubber trees grow rapidly, are very hardy, stand the tapping operation well, and yield a rubber of high quality

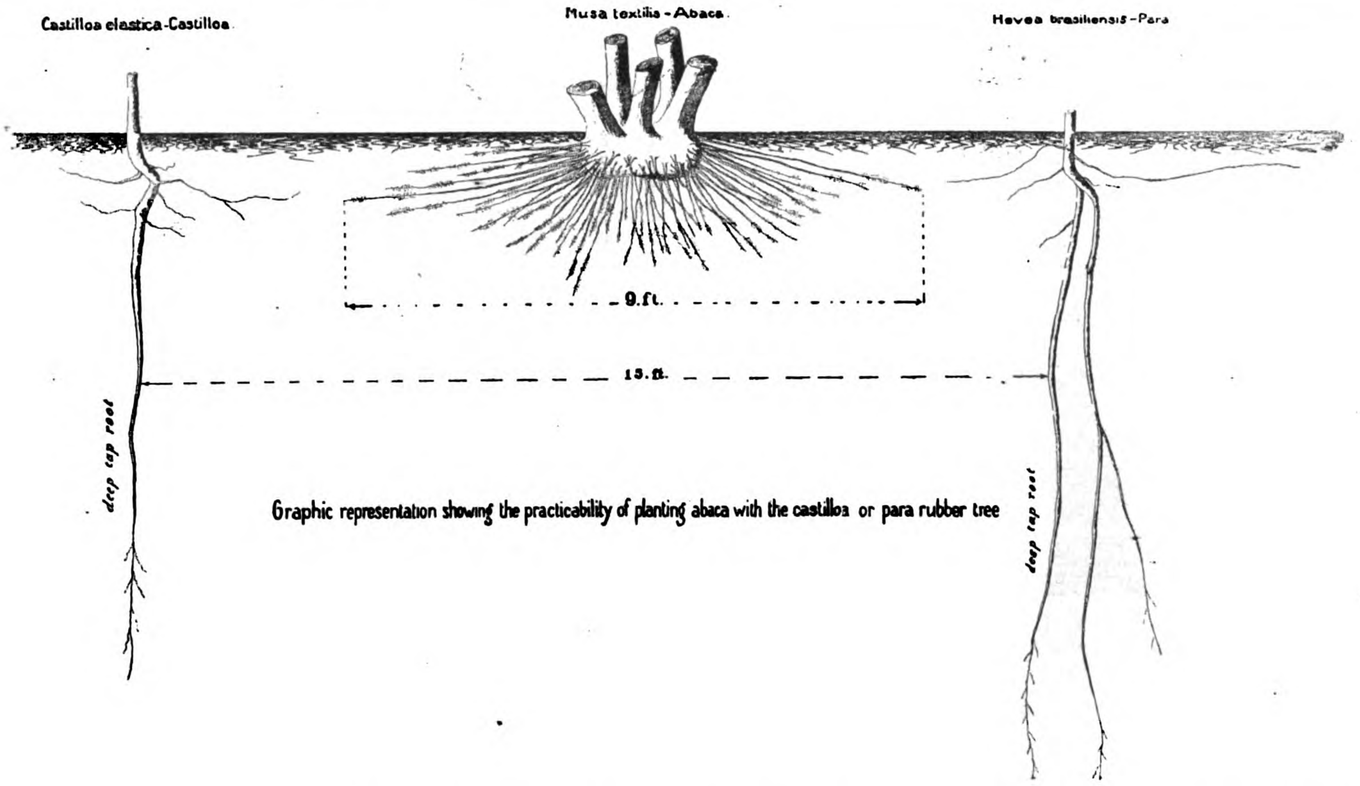
"The rate of growth and present immunity from pests of *Hevea brasiliensis* put it, in Ceylon, above Funtumia (*Funtumia elastica*); its yield places it on an equal or even higher plane than the best Castilloa (*Castilloa elastica*) from Panama or Mexico, and its hardy characteristics and response to the extensive use of the ordinary tapping knife render it superior to Ceara and the other rubbers."—*Herbert Wright* in lecture at Ceylon Rubber Exhibition.

In discussing when tapping may first be done, it is necessary to take into consideration the age and size of the tree. If the tree is less than 20″ in circumference, 3′ above the ground, tapping is not recommended, as the available working area of bark is too small to yield profitable results. The production of new tissue is also a great drain on so young a plant, and is liable to prove injurious.

In Ceylon, India and the Federated Malay States, Para trees 6 to 7 years old are considered mature for tapping.

Ceara trees have been successfully tapped in India when 2½ years old, and a fair quality of rubber produced. It is usual, however, to wait until the trees are from 4 to 6 years old, at which time a high grade rubber is obtained.

The value of rubber from Castilloa depends, in almost every case, on the age of the tree. Young trees produce a sticky, resinous rubber of inferior quality. In the Federated Malay States it has been found that rubber cannot be obtained in paying quantities until the trees are at least 7 years of age. In India, however, by careful washing a good quality of rubber has been obtained from trees 4 years old.



Graphic representation showing the practicability of planting abaca with the castilloa or para rubber tree

RUBBER-PRODUCING CENTERS OF THE WORLD.—The three great rubber producing centers of the world at the present time may be broadly classified as follows:—(1.) East Indies: British India, Ceylon, Burma, Federated Malay States, Straits Settlements, Java, Borneo, etc.; (2) Africa: Numerous foreign possessions and free states along the coast of Africa; Madagascar; (3) Mexico, Central and South America.

ELECTRIC POWER TRANSMISSION, CALIFORNIA

The Stanislaus Electric Power Company, through its working concern, the Union Construction Company, has just closed a contract for an electric power transmission scheme of extreme importance to California industries. The site of the proposed plant is at Vallecito on the Stanislaus River near Angels Camp, Cal., and the scheme contemplates the utilization of the waters of the Stanislaus River, transmitting the power electrically to San Francisco, and incidentally tapping the Southern Mines and the Upper San Joaquin Valley. From a hydraulic standpoint the proposition is of peculiar interest as it involves the largest power units that have ever been used for impulse wheels. The operating head is 1,400′, equivalent to a pressure of 608 lbs. per square inch. The present equipment calls for three 6,700 kw., 400 r. p. m. General Electric generators, each of which will be driven by a Pelton waterwheel unit of 12,000 h. p. capacity. Not only are the individual units larger than heretofore attempted, but the capacity of the station in excess of 36,000 h.p. is greater than any existing at the present time. The only instance approaching this in impulse waterwheel practice is the Plant of the Puget Sound Power Company, at Electron, Wash., in which are installed four Pelton waterwheel units, each driving a 3,250 kw. generator, with a combined maximum capacity for the station of 30,000 h. p.

The units for the Stanislaus plant will be of the double *overhung* construction, characteristic of Pelton design for high power practice. Each unit will consist of two Pelton wheels, each overhanging the opposite end of a heavy shaft which carried the rotor of the generator in the center. Some details of construction covering these immense units may be of interest.

The wheels proper each consist of caststeel annealed disc-center to which are attached the Pelton buckets, also of caststeel. The buckets will be secured to the center by means of turned-steel bolts hydraulically pressed into reamed holes—a novel point in waterwheel construction. The shaft will be fluid-compressed hollow-forged nickel steel, 28′ in length, 20″ in diameter at the center where the rotor is located, and 16½″ at the waterwheel journals. The wheels and rotor will be designed for a press fit on the shaft at 100 tons pressure. The journals, one on either side of the generator, will be larger than any heretofere designed for this class of work, being 16½″ in diameter by 60′ long. They are of the ring-oiling, ball-and-socket type, water-jacketed and provided with an oil-pressure and gravity-feed lubricating system. Also there will be furnished electric thermostats and indicators to give warning of an excess rise in temperature. The nozzles will be of the needle-deflecting type, admitting of close regulation and water economy, and are of caststeel, as are also the gate valves. These latter will be of the single-disc Pelton type with phosphor bronze seats ground in place. They will be provided with roller bearings to relieve the thrust on the stems, and will be actuated through gearing by means of small Pelton motors. At the switchboard will be located the main pilot control, by means of which the operation of gates, nozzles and needles may be under the immediate control of the station attendant, small Pelton motors and direct acting plungers being employed for this purpose. All pressure parts on these units are to be subject to a cold-water test of 1,200 lbs. per square inch in the shops before shipment. The equipment will represent the highest development in hydro-electric transmission, and the installation is looked forward to with the greatest interest by engineers generally.

This contract is under the direct supervision of the engineering firm of Messrs. Sanderson & Porter, New York City, the complete equipment being furnished by the Pelton Water Wheel Company, and the electrical apparatus by the General Electric Company. Indications are that the year 1907 will eclipse its predecessor in the development of hydro-electric power transmission. The Pelton Water Wheel Company reports unusual activity in this direction and will carry over unfilled orders aggregating the largest in the history of its business. The market tendency is towards high speed, large power units. For example, the California Gas and Electric Company is installing a Pelton wheel of 10,500 h. p. maximum capacity. The Telluride Power Company, of Colorado, is adding to its equipment one 5,000 h. p. Pelton wheel under 1,800′ head. This company has installed a continuous lapweld, high-pressure pipe made by the Ferrum Company, of Germany, which the Pelton Water Wheel Company has introduced in America with much success ni the last two years. The Siskiyou Electric Power Company has ordered two Pelton wheel units, each of 2,000 h. p. capacity, these being in addition to its present waterwheel equipment.

THE MALAYAN MINER

Says a British authority on mining conditions in the Federated Malay States:—"The Malayan miner in the Federated Malay States has two bad qualities—possibly, one or two more. He still holds human life dirt cheap when he gives reins to passion, and he is probably the most inveterate and incurable gambler on earth. When, consequently, bad luck attends his speculations, there is always danger of his squaring accounts with Fate by miscellaneous stabbing. Running amok is regarded in the peninsula as the natural sequitur to losses at play. Here, then, would appear to be a most promising opening for that Radical reforming zeal which, in the case of certain other Asiatic miners, would expel Nature—and the toilers themselves—with a fork. But there is one code of morality for Malaya, and quite a different one for the wicked Rand. It is proposed by the Colonial Office to confine the prohibition of the gambling farms in Malaya to non-mining areas, leaving them in full operation elsewhere. By this curious method of discrimination, the revenue derived from letting the farms, usually to Chinese speculators, will be maintained, while should some thin-skinned Radical protest against the vice being turned to account for State profit-making, it will be pointed out how gambling farms have almost vanished from the non-mining districts, where they have never been in nearly so much request."

MOTORS IN THE FAR EAST

Writing to the Bureau of Manufactures of the Department of Commerce and Labor at Washington, Mr. D. F. Wilber, American Consul-General at Singapore, states as to conditions in Singapore, the Straits Settlements, Federated Malay States, and the islands of Sumatra, Java, and Borneo, the motorcar trade is yet in its infancy. In Singapore there are at present about 60 passenger machines and some 15 or 20 freight carrying lorries. The only representatives of American cars are one or two Oldsmobiles and one or two Reo cars. The balance are entirely English and French in manufacture.

In the City of Singapore the cars are practically all owned by doctors, professional men, and some few motor enthusiasts, and the interest in motor trade grows daily. The field being practically uncanvassed for many years, it has not yet been thoroughly gone over, nor have the majority of the right people been approached for the sale of motor cars. The roads are excellent, being entirely macadamized, and are constantly cared for by the Government; in some portions of the city the gradients run from 2 to 30, and in no instance are the roads less than 60′ wide. To obtain a license to drive a motorcar or a motorcycle, one must apply and pass an examination before the Chief of Police, and if, in his estimation, the candidate is capable of handling a car, the license is granted on payment of a fee of $1 Straits currency, equivalent to 56 cents United States gold. The drivers, outside of Americans and Europeans, are mostly Chinese and East Indians.

The demand for motorcars is increasing, and aside from Singapore it is growing extensively in the Federated Malay States and in Sumatra and the other islands in this vicinity. The Chinese and natives take to motoring very kindly; their chief interest being centered in the decorations and color of the body of the car rather than in the ability or workmanship of the engine. The worst difficulty in this part of the globe is the constant heat, which, by the way, is in no way more oppressive than the heat in New York and Chicago in the early summer. This causes constant tire troubles, and while the majority of cars are equipped with pneumatic tires they are now putting on clincher tires, taking the risk of injury to the engine and car in preference to constant purchasing of new tires. At present there is one fairly good garage at Singapore; besides this there is a motor engineer expert from home who is passing upon defects and breakdowns that occur and handing them over to the garage people, which permits of the same care and attention to the cars that one gets in the States. It is possible to get extra parts, casting, and other special work made in the local machine shops, so that one really does not suffer much by being so far from the headquarters of the various factories.

The favorite car for these parts is a 4-seated 10 to 12 h. p. double cylinder; and although there is no speed limit, there is not much *scorching*. Gasoline can be had in any quantity and fairly cheap, as there is any amount brought from Sumatra. The motor spirit is not so heavy as the American article, there being a tendency for evaporation and leaving water in the bottom of the tank. This, however, is rapidly getting better.

The cars in use, with the exception of one or two, have no magnets, but rely entirely upon accumulators and coils for the spark. An enterprising magnet manufacturer could do an excellent business if he entered the field and his prices were right, as battery troubles are very common. Lubricating oils are all first-class and very little trouble occurs through that source. The air-cooled motor here is not a success, the weather being entirely too warm; the radiators upon the water-cooled machines will sometimes remain hot for days at a time.

The conditions in the islands of Sumatra, Java, British North Borneo, and also the Federated Malay States are practically the same as in Singapore. Owing to the absence of railway accommodation, and in most parts there being no railway at all, the Government has spent a great deal of money on making excellent roads, and the rich natives are in prime condition for the purchase of these commodities, but in face of the stiff prices for American-made machines, English and French manufacturers are reaping the harvest, and will continue to do so for some years to come, unless the evils referred to as to prices, freight rates, and deliveries are overcome.

The whole proposition summed up resolves itself into one of two things—either American manufacturers must bring pressure to bear upon the steamship companies in order to lower their freight rates, and they themselves be a little more prompt in deliveries for the eastern trade, instead of sidetracking Eastern orders in favor of those closer to home, or else they must figure so that a part of their profit is cut down, so the machine is delivered here at such a figure that the American agent can enter the field on the same basis as the foreign agents. Until this is done the American-made cars will always be in the minority. Even the tire manufacturers can not compete with the foreign agents, and this portion of the motor business is the best paying out here.

The motor-boat business is being pushed mainly by an American manufacturer's agent, and there are quite a few being sold, but the main opening and the big business is for horseless vehicles.

On this automobile question an American house has prepared for Mr. Wilber the following statement: Among the rich Chinese who have taken to automobiles, one at Kuala Lumpur owns four French cars. There is hardly room for great extension of automobiles for pleasure purposes in Singapore, for the island is small and there are no opportunity for making long runs. The roads are good practically all over the island, but motoring becomes rather monotonous in a limit of 35 or 40 miles. There is a field for automobiles for freight carrying. These have been operated very successfully in the Federated Malay States and could be used more generally in Singapore. One firm has four of these motors in use in Singapore for delivering goods in cases, and it is only a question of a very short time when other concerns will follow suit. At present practically all the deliveries of goods from the wharves, in some cases covering distances of from 3 to 3½ miles, are made by bullock carts, which are slow, of limited capacity, and sometimes hard to get.

One thing that has militated against the introduction of motors for commercial purposes has been the extraordinary high price of benzine, but the price has been reduced from 42 cents gold to 28 cents gold per gallon. Even this is too high, as up to within two years benzine was a waste product in the Dutch oilfields and was thrown away. The efforts made to popularize motor launches and stationary gasoline engines led to a reduction in price. When we can get the local price down to 14 or 17 cents gold a great impetus will be given to importation of motor trucks, as it will cheapen their operation.

"There are two things which are going to hamper us very much in the introduction of motor trucks from the United States," says Mr. Wilber, "the high ocean rates now being enforced by the shipping combine, and secondly, that we can not depend upon deliveries from American manufacturers in a reasonable time. The buyer of a firm, formerly one of the biggest importers of American manufacturers' goods, recently informed me that his indents to America now were not 10 per cent of what they were four years ago, simply because he had to wait eight to 10 months, and sometimes a year before he could get his goods (he was speaking particularly of machinery). It simply drove his firm to look out for other machinery that would take the place of American, and in some cases to buy American machinery from second hands in Europe at higher prices, because in that case he could depend upon delivery within a reasonable time. Just so long as we have to depend upon our present uncertain steamship service from New York direct to the Straits Settlements, the present high rates, and the indifference of American manufacturers, we shall have difficulty, not only in introducing new lines but in holding our own on lines which we have already established."

SUGAR-REFINING IN JAPAN

According to the *Japan Chronicle* the sugar-refining industry in Japan has made much progress in recent years. The principal factors that have brought about the development are attributed to an increased consumption in the country, the increasing demand abroad, the effect of tariff legislation, and protection of the industry in Formosa. Despite the opinion which was expressed to the contrary, in some quarters, optimistic views seem to be generally entertained among those who are concerned in the business as to the future of the industry. Hitherto the large sugar manufacturers in Japan have been the Nippon Seiseito Kaisha, of Tokyo, the Nippon Seito Kaisha, of Osaka, the Dairi and the Formosa Seito Kaisha. Their total capital up to last year did not exceed -Y-9,500,000. The first and second companies mentioned above have since amalgamated and the capital has been increased from -Y-5,500,000 to -Y-12,000,000. The Formosa company has also increased the capital of -Y-1,000,000 to -Y-5,000,000 while the Dairi concern is contemplating taking a similar step and bringing up its capital to -Y-4,000,000. The capitalization of these companies will stand thus:—

	Before increase	*After increase*
Nippon Seiseito..	-Y-5,500,000	-Y-12,000,000
Dairi Seito.......	3,000,000	4,000,000
Formosa Seito....	1,000,000	5,000,000
	-Y-9,500,000	-Y-21,000,000

Thus, the capital of the three existing companies has been more than doubled within a short space of time. Turning to the starting of new companies, the following are the leading ones:—

	Capital.
Yokohama Seito..............	-Y- 1,500,000
Toyo Seito....................	5,000,000
Nagoya Seito	1,000,000
Toa Seito....................	2,000,000
Meiji Seito..................	5,000,000
	-Y-14,500,000

Besides these, there are several other smaller sugar manufacturing companies that have been established or are under project with a capital under -Y-1,000,000, but these have been left out of account. When the increased capital of the old and the capital of the new companies are put together a total is formed of -Y-26,000,000, which, compared with the capitalization of -Y-6,500,000 at the end of last year, shows an increment of 370 per cent. The condition of the sugar industry in Japan, as judged by the amount of capital invested, is as follows:—

	Paid-up capital
1899	-Y- 1,268,984
1900	2,591,000
1901	2,737,800
1902	2,648,500
1903	2,710,300
1904	3,564,800
1905	4,932,800
1906	10,064,800

As shown above, the industry has made nearly treble progress during the last three years as far as the capital is concerned and though no doubt much of the capital is invested in fixed property such as plant and buildings there can be little question that the manufacturing capacity has been materially augmented. The importation of foreign sugar from 1900 to 1904 is shown below:—

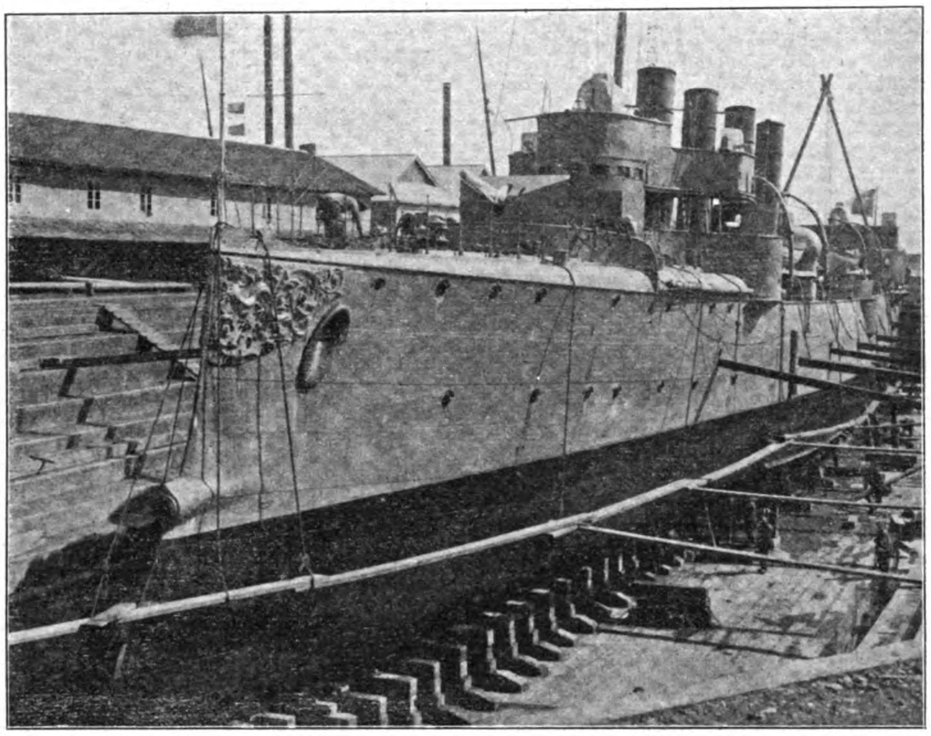
	Brown	*Refined*
	1,000 *kin.*	1,000 *kin.*
1900	209,178	195,390
1901	228,182	264,265
1902	178,446	85,366
1903	294,985	97,363
1904	338,921	71,553

The gradual decrease in the importation of refined sugar as shown above and the increase in brown is manifestly the result of the progress of the Japanese industry.

Japan's Foreign Trade, 1906.—According to the Tokyo correspondent of the *North China Daily News* Japan's trade returns for 1906 show that exports amounted to -Y-442,593,348, an increase -Y-101,059,738 or 3.1 per cent compared with 1905, and imports to -Y-418,471,401, a decrease of -Y-70,066,616 or 1.4 per cent. This implies an excess of exports over imports of -Y-4,121,947 against an excess of imports over exports of -Y-167,004,407 in 1905, and the total exports and imports stand at -Y-841,064,749, an increase of -Y-31,886,298 or 0.3 per cent. The decline in imports last year was only due to the discontinuance of the importation of war materials. Foreign trade for the year is remarkable in respect of the unprecedented total attained of imports and exports and of an excess of exports for the first time during the last 10 years.

GROWTH OF THE KIANGNAN DOCK AND ENGINEERING WORKS.

The Kiangnan Dock and Engineering Works, one of the most enterprising and ably-conducted concerns of its kind in the Far East, is situated on the left bank of the Whangpoo River, about 3½ miles from Shanghai. The premises now occupied by the company originally formed part of the Imperial Chinese Government Arsenal and Dockyard, at Kiangnan, and is still contained within its walls, although the the engineering staff of Messrs. S. C. Farnham, Boyd & Co., Ltd., of Shanghai, of which the present Dock and Engineering Company, Ltd., is the successor. All of these gentlemen enjoy a high reputation in the marine engineering field of the Orient and the rapid growth of the business of the Kiangnan works is the best testimony of their ability and enterprise.



KIANGNAN DOCK WITH A CHINESE CRUISER ON THE WAYS

establishments are now quite separate. The arsenal and dockyard came into being about 40 years ago, to meet the requirements of the Chinese Government for the manufacture of cannon and the repair of the few small ships of war it possessed at the time, and has gradually grown to its present splendid dimensions. About 18 months ago the dockyard portion of the arsenal, comprising an area of about four acres lying between the steel works and gun factories and the Whangpoo, became separated from the arsenal and was taken over by the present company and launched as a going commercial concern. The directors of the Kiangnan Dock and Engineering Works are Admiral C. P. Sah and Captain Y. K. Woo of the Imperial Chinese Navy, and Mr. L. Basse. The manager is Mr. R. B. Mauchan, formerly of

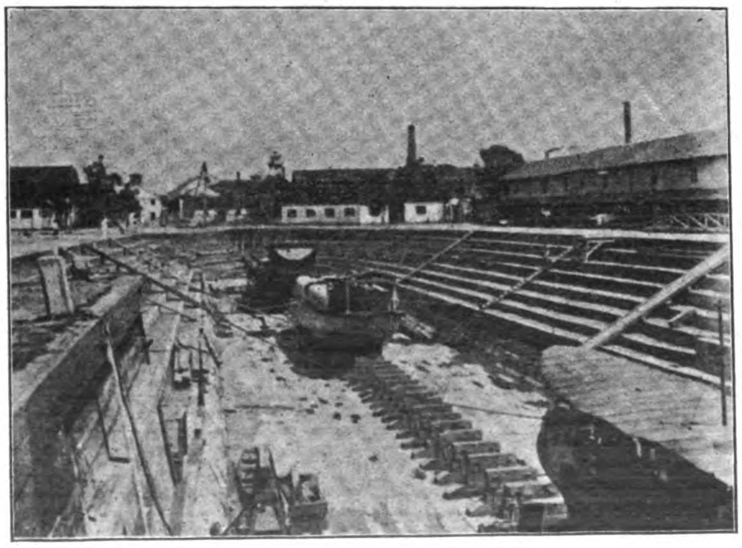
DRYDOCK.—The drydock, which was very small and totally inadequate for the purposes the company had in view when it took over the works, was first given attention. It was lengthened about 40′ and deepened 3′, the bottom newly piled and decked, and new reel-blocks installed throughout. The somewhat antiquated pumping machinery was removed and a new modern pumping plant installed, consisting of two 20″ and one 10″ centrifugal compound pumping engines. The pumping plant is contained in a large steel tank sunk about 12′ into the ground and rests on a huge concrete foundation. Steam is supplied by two large Lancashire boilers arranged with separate flues and funnels, while an auxiliary boiler of the marine type is fitted for use in case of emergency—all with a working pressure of 100 lbs. per square inch. A feedwater heater with feed pumps of the Worthington type in duplicate is supplied for feeding the boilers. The pumphouse, though built primarily for housing the boilers and pumping machinery, also contains the dynamo engineroom, together with lavatory and bathrooms for the convenience of the crews of the ships using the dock; dock tool store, etc. On either side of the dock entrance are wharves alongside of which ships entering or leaving the dock, or refitting, can lay. On the upper wharf is fitted a pair of heavy sheerlegs, capable of lifting 60 tons, with boiler and winding engine complete. In the river and right abreast of the company's premises are three buoys for the accommodation of ships undergoing repair.

BOILER SHOP.—Passing up the side of the dock and bearing a little to the left one comes to the shops where towboats, launches and other small craft are hauled up for repair; and nearby is the boilershop with its punching, shearing plate-bending, angle iron-bending, plate edge-planning and drill machines; plate furnace, frame-bending floor and the usual accessories of a modern boiler shop. The machinery of this shop is driven by a large Tangye engine, while alongside of it is another engine of similar dimensions which is kept ready for immediate use in the event of an accident happening to the former. Steam for these engines is supplied by two large Lancashire boilers.

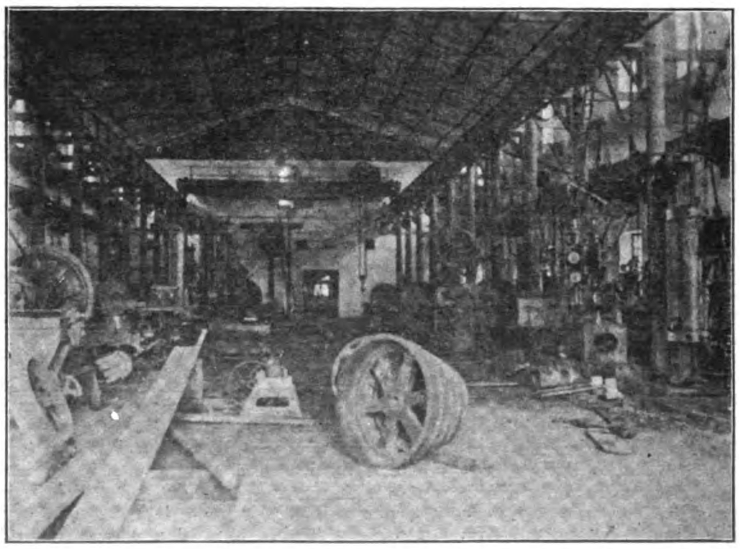
RESIDENCES AND GENERAL OFFICES.—Beyond the head of the drydock and the carpenter shop, mould loft and a number of huge godowns used for the storage and seasoning of timber, stands a handsome building recently erected, one wing of which is to be used as a residence for the foreign employés of the company and the remainder as a residence for Chinese students, while the basement floor is occupied by billiard and reading room, offices, etc. Nearly opposite this building are the company's offices, the ground floor of which is occupied by the directors, the managers and accountants, while the whole of the upper story is devoted to the designing and drawing staff.

MACHINE SHOP.—Just over the way from here is the machine shop, a large and commodious building, which is served by a 40-ton travelling crane supported on columns with steel girders and running the whole length of the shop. The heavy lathes and planing and boring machinery are placed on either side of the central aisle where they can be easily and rapidly served by the travelling crane, while the two side bays are filled with the smaller lathes and machines.

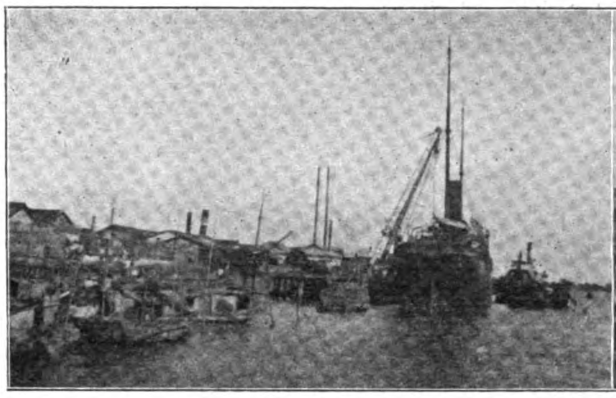
On first entering this fine shop one's attention is immediately taken by a huge triple-geared face lathe manufactured by Messrs. Craven Bros., of Manchester, the chuck of which is capable of taking in a piece of work 10′ 6″ diameter by 3′ in length. Next to this and in a line with it, is another heavy triple-geared sliding-surfacing screw-cutting lathe, also by Messrs. Craven Bros., 25″ centers and capable



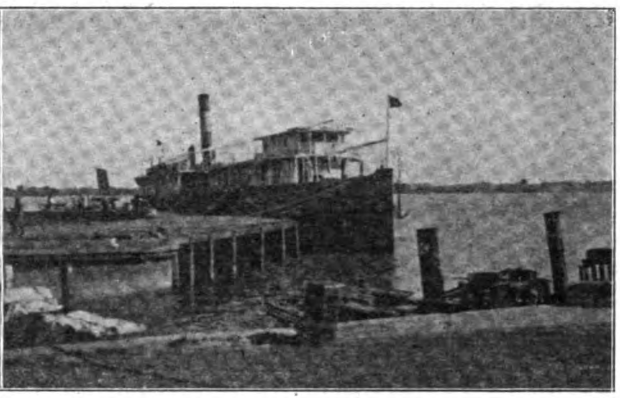
GENERAL VIEW OF THE DOCK



MACHINE SHOP SHORTLY BEFORE COMPLETION



RIVER VIEW OF THE WORKS



EAST WHARF FROM DOCK ENTRANCE

of taking in a piece of work 32′ in length, which with its two double-slide rests carrying four tools, all of which can be put in operation at the same time, render this a very valuable machine indeed. Next comes a heavy horizontal drilling and bolting machine with two massive boring heads, each of which can be worked independent of the other, and capable of doing a large variety of work. Immediately adjoining this is a vertical planing machine with horizontal traverse, which can take in a machine a piece of work 10′ 6″×16′ long. A large horizontal planing machine comes next, and several smaller machines. The other side of the shop under the crane is similarly fitted with heavy machines, among which are a heavy American slotting machine and two useful horizontal boring machines. The side wings, as has been mentioned before, are closely packed with a large variety of lathes and planing, slotting, screwing and drilling machines, manufactured by Archdale, Whitworth, Crane Bros., McOnie & Co., and other well-known makers, including a number of American products. Power for this part of the work is supplied by a large horizontal h. p. expansive engine, while in an enginehouse immediately adjoining is a large double-cylinder engine of about the same power ready to be put in operation at once should the necessity arise, it being the principle of the company to take all reasonable precautions to prevent stoppage of the works in the event of a breakdown.

FOUNDRY AND OTHER SHOPS.—Passing now through a small auxiliary machineshop containing a number of lathes, wheel-cutting, milling and other machines, which, owing to increase of business, it has been found necessary to put into operation, the foundry is encountered. This building, before its transfer to the present company, was used as a shot and shell factory, evidence of its former activity in the shape of huge projectiles of every caliber being met with all over the extensive premises. The foundry is equipped with three 2-ton cupolas, and a large new cupola, with drop bottom and all the latest improvements and capable of melting eight tons of metal per hour, is now nearly completed. The foundry is served by one large 15-ton jib crane, a 3-ton and several smaller cranes. Immediately under the 15-ton crane is a large iron circular casting pit, capable of casting propellers up to 18′ diameter.

The brass foundry contains three ordinary and one Carr's patent crucible furnace, and a great variety of iron and brass castings ranging from a few ounces to many tons in weight are being constantly turned out.

Adjoining the foundry is the pattern shop and in close proximity is the smithy. This latter shop contains a large steam hammer, served by two 4-ton jib cranes and capable of welding propeller shafts up to 14″ diameter. A somewhat smaller hammer is provided for ordinary work, and both are in constant use, the smithy in works of this kind being generally a very busy shop indeed. The coppersmith shop adjoins the smithy and seems also to be a very busy adjunct, but otherwise calling for no special comment.

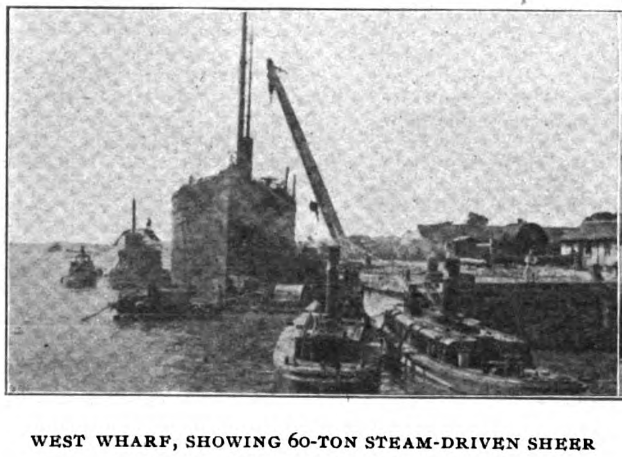
Rails are laid from the dock and wharves into the various shops for the expeditious handling of heavy pieces of machinery, while an efficient water service, supplied with the water from the adjacent Chinese Inland Waterworks, with numerous hydrants all over the works, testifies to the care and thoughtfulness of the management.

MAGNITUDE OF THE MARINE WORK.—Before closing this article and to give some idea to those whom it may concern of the capabilities of these works and the magnitude of the contracts they are prepared to undertake, it might be mentioned that several months ago the steamer *Kiangfoo*, a large paddle steamer belonging to the China Merchants' Steam Navigation Company running on the Yangtsze River, met with an accident and completely wrecked her engine, which was of the walking-beam type. The repairs were entrusted to the Kiangnan Dock and Engineering Works. The steamer came alongside the company's wharf, under the sheerlegs, and work was immediately commenced by lifting out the broken engine beam, broken cylinder, cylinder cover and piston with its pistonrod badly bent. A new cylinder, 13′ long by 76″ diameter and weighing 16 tons was successfully moulded and cast; also a new skeleton for the walking beam and a new cylinder cover. A new iron diamond frame for the walking beam was forged in the smithy, machined, heated and stuck on to the skeleton. The holes for the end and center pins were accurately bored out and the huge pins fitted and shrunk in and tightly and efficiently keyed up, the whole beam in its finished state weighing nearly 11 tons. The pistonrod was drawn from the piston after some difficulty, straightened, turned and refitted, and the piston fitted with new rings. Finally the whole of this heavy machinery was lifted on board the ship, the cylinder jointed, the great beam lifted into its bearings on the top of the gallows frame, and the engine connected up, the whole job occupying a little over three months and forming altogether the largest job of its kind ever undertaken in the Far East. The steamer ran her trial trip immediately the job was completed to the satisfaction of every one concerned, and has been running with great success ever since. This work, undertaken at a time when the company may be said to have scarcely started business, when the shops were in a state of transition and order was being evolved out of chaos, so to speak, and with a large quantity of other work on hand, reflects the greatest credit on the management and the able staff at its command.

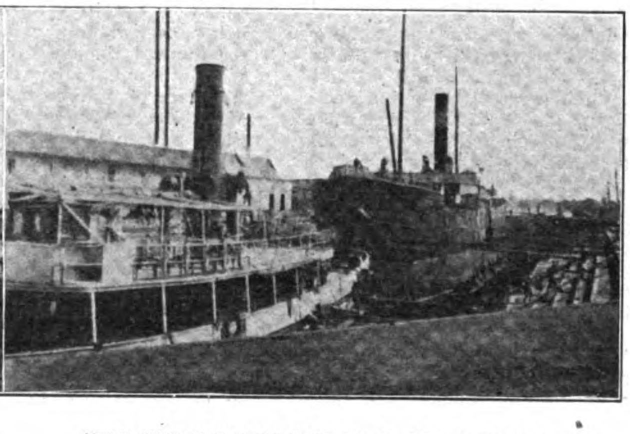
Since the opening of the dock on December 2d, 1905, it has been occupied continuously, the total tonnage docked to the end of November, 1906, being upwards of 153,500 tons.

TOKYO INDUSTRIAL EXHIBITION

An industrial exhibition will be held at Uyeno Park, Tokyo, from March 20th to June 20th, inclusive. The *Hakuran-kwai-Kyosan-kwai* (Exhibition Auxiliary Association) has been recently organized, with the object of affording an especially cordial welcome to visitors from abroad, and to assist them in viewing the far-famed scenery of Japan and in enjoying the sights which travel in the interior of Japan may bring to their notice. The exhibition will be open during the most delightful season of the year, making journeys into the country most enjoyable. Every convenience will be prepared for visitors to enable them to spend their time and money to the best advantage. The President of the Exhibition Auxiliary Association is Baron Takatomi Senge; Mr. Yukio Ozaki is First Vice-president and Mr. Buyei Nakano Second Vice-president.



WEST WHARF, SHOWING 60-TON STEAM-DRIVEN SHEER



TWO STEAMERS IN THE DOCK FOR REPAIRS

HERMANN KRUSI, C. E.

Hermann Krusi is dean of the American civil engineering contingent in the Philippine Islands. Besides being one of the best-known members of his profession in the United States, his reputation has followed him to the Orient where he is everywhere regarded with the highest esteem, not only on account of his great ability as an engineer but because of his modest yet thorough manner of doing business.

Mr. Krusi has been a leading spirit in his profession in America for many years. Born in Worcester, Mass., in 1858, he spent the most of his boyhood days in Oswego, N. Y. He was graduated from the classical course of the Oswego Normal School in 1878, and from Cornell University with the degree of C. E. in 1882. Shortly after leaving college he went to the Pacific Coast to follow his profession, and from 1884 to 1900, inclusive, he held the position of Chief Engineer of the San Francisco Bridge Company. In this capacity he designed and constructed a large number of railroad and highway bridges on the Pacific Coast, many of them of great magnitude and with large spans and high piers.

When the Atlantic, Gulf and Pacific Company was organized Mr. Krusi was chosen its First Vice-President, which office he has held continuously since its foundation. After the death of President George W. Catt, the directors offered the presidency of the company to Mr. Krusi, but he declined the honor preferring to retain his present status where he believed he could be of greater service to the corporation.

The Atlantic, Gulf and Pacific Company went into hydraulic dredging while the business was in its infancy and today is the largest hydraulic dredging concern in the world. With others Mr. Krusi designed and patented a special excavator for the Colusa Irrigation Canal, in California, and following close upon this successful departure in dredging methods came the beginning of construction by the company of twenty hydraulic dredges, of which number it owns and operates thirteen at the present time. In average material the company's plant has an easy annual capacity of 30,000,000 cubic yards, and to fully appreciate how much 30,000,000 cubic yards *per annum* means, one needs only refer to the specifications of the Panama Canal, from which it will be seen that the total dredging in connection with that gigantic engineering undertaking, including the harbors of Colon and Panama, is only 26,000,000 cubic yards. The total material handled by the company, or now under contract, aggregates more than 100,000,000 cubic yards, of which approximately one-half has been done for the Federal and Insular Government, and the other half for railroads and other private interests in the United States. The Atlantic, Gulf and Pacific Company does not confine its field strictly to dredging, but includes general civil engineering and contracting for excavation and reclamation, and construction work of every description. The head office of the company is in New York City, in addition to which it has branches in San Francisco, Manila, Seattle, Los Angeles, Vancouver (B. C.), and Panama.

These few facts about the magnitude of the Atlantic, Gulf and Pacific Company are only cited to indicate what an important part Mr. Krusi must have taken in building up its present particular and wide field of engineering. When the company decided to establish its Manila office, Mr. Krusi was selected to come out and assume the general management of the business. With his customary aggressiveness he soon made this Oriental branch one of the most important in the company's business organization. He has constructed the new harborworks of Manila, containing about 7,000,000 cubic yards of dredging and 1,000,000 tons of rockwork, besides concrete and masonry work in large quantities. He also constructed the Marine Railway at Engineer Island, the new Ayala Bridge, the Protestant Episcopal Cathedral Church of St. Mary and St. John, the Pasig River walls, and much other important work the enumeration of which would be useless for the purposes of this sketch. He is now building two sections of the new Manila gravity water supply, *viz*, the pipe line about 11 miles long, and the tunnel and viaduct, the former 4 and the latter 1½ miles long. He is also building the new Manila sewer system, a work of large magnitude, including 6,000′ of 42″ submerged castiron outfall into Manila Bay, 40 miles of vitrified pipe sewers and 7½ miles of concrete sewer.

Unde the supervision of Mr. Krusi, the Atlantic, Gulf and Pacific Company has just completed a large and splendidly-equipped structural-steel and bridge works at the confluence of the Pasig and San Juan Rivers. In this shop will be constructed the magnificent double-track drawbridge across the Pasig River, at Pandacan, for the Manila Railroad Company. This bridge was designed complete—both sub- and superstructure—by the Atlantic, Gulf and Pacific Company at Manila, under Mr. Krusi's personal direction.

The new tanks for Fort McKinley will also be constructed at these shops, as well as the waterworks pipe line for the City of Manila and the piers for the new steel and concrete wharves at Manila, now under contract with the Philippine Government, these contracts being taken for the Atlantic, Gulf and Pacific Company by Mr. Krusi.

Probably one of the most important features of Mr. Krusi's engineering career in the Orient is his successful solution of the problem of Filipino labor. He was the first American to obtain satisfactory results with this labor and to employ the natives satisfactorily in every class of work required.

THE HONGKONG AND SHANGHAI BANKING CORPORATION

Following is the 83d report of the Court of Directors of the Hongkong and Shanghai Banking Corporation to the shareholders at their ordinary half-yearly general meeting, which was held in the City Hall, Hongkong, February 18th, at noon:—

Gentlemen:—The directors have now to submit to you a general statement of the affairs of the bank, and Balance Sheet for the half-year ended December 31st, 1906.

The net profits for that period, including $1,712,472.37, balance brought forward from last account, after paying all charges, deducting interest paid and due, and making provision for bad and doubtful accounts, amount to $4,433,102.68. The directors recommend the transfer of $750,000 from the Profit and Loss Account to credit of the Silver Reserve Fund, which fund will then stand at $11,000,000. After making this transfer, and deducting Remuneration to Directors, there remains for appropriation $3,668,102.68, out of which the directors recommend the payment of a dividend of £1 15s. per share, which at 4/6 will absorb $622,222.22, and a bonus of £1 per share, which at 4/6 will absorb $355,555.55. The difference in exchange between 4/6, the rate at which the dividend and bonus are declared, and 2/3⅛, the rate of the day, amounts to $968,786.01. The balance $1,721,558.90, to be carried to new Profit and Loss Account.

New Capital.—After careful consideration, your directors have decided that it is desirable to further increase the capital of the bank, from $10,000,000 to $15,000,000. A circular will be issued to shareholders shortly, and later an extraordinary meeting of shareholders will be called to obtain your sanction to the scheme being carried out, when your directors will recommend the creation of 40,000 new shares of $125 each, to be issued to shareholders at the price of £30 each, payable at current rate of exchange, in the proportion of one new share to two old shares.

Directors.—Mr. G. H. Medhurst has been elected Chairman for the year 1907, and the Hon. Mr. W. J. Gresson Deputy Chairman. Mr. H. A. W. Slade, having resigned his seat on leaving the Colony, Mr. G. Balloch has been invited to fill the vacancy. The appointment requires confirmation at this meeting. Mr. A. Haupt, Mr. R. Shewan, and Mr. A. J. Raymond retire in rotation, but being eligible for reelection, offer themselves accordingly.

Auditors.—The accounts have been audited by Mr. W. Hutton Potts and Mr. A. G. Wood, who offer themselves for reelection.—(*Signed*) A. Haupt, *Chairman.*

The report of the directors was concurred in by the shareholders and the elections resulted as therein recommended.

Asbtract of assets and liabilities of the Hongkong and Shanghai Banking Corporation, December 31st, 1906:—

Liabilities

Paid-up Capital		$10,000,000.00
Sterling Reserve Fund		10,000,000.00
Silver Reserve Fund		10,250,000.00
Marine Insurance Account		250,000.00
Notes in Circulation:—		
Authorized issue against securities deposited with the Crown Agents for the Colonies	$10,000,000.00	
Additional issue authorized by Hongkong Ordinance No. 19 of 1900, against coins lodged with the Hongkong Govt.	6,075,825.00	
		16,075,825.00
Current accounts:—		
Silver	$68,932,875.86	
Gold, £4,131,638 11s. 2d. =	36,089,096.66	
		105,021,972.52
Fixed deposits:—		
Silver	$49,329,279.33	
Gold, £5,138,163 5s. 1d. =	44,858,630.53	
		94,187,909.86
Bills Payable (including Drafts on London Bankers, call loans and short sight drawings on London office against bills receivable and bullion shipments)		13,878,966.22
Profit and loss account		4,433,102.68
Liability on Bills of Exchange re-discounted £6,162,364 8s. 10d. of which £4,035,759 8s. 9d. have since run off.		
		$264,097,776.28

Assets

Cash		$39,896,108.72
Coin lodged with the Hongkong Government against note circulation in excess of $10,000,000		10,000,000.00
Bullion in hand and in transit		2,047,016.00
Indian Government rupee paper		2,038,021.12
Consols, colonial and other securities		6,598,016.73
Sterling reserve fund investments, viz:—		
£598,00 2½% consols at 82 (of which £250,000 lodged with the Bank of England as a Special London Reserve.)	£ 490,360	
£255,000 2¾% National war loan, at 90	229,500	
£325,000 other sterling securities, written down to	280,140	
	£1,000,000	10,000,000.00
Bills discounted, loans and credits		93,039,746.29
Bills receivable		99,034,593.40
Bank premises		1,444,274.02
		$264,097,776.28

General Profit and Loss Account, Hongkong and Shanghai Banking Corporation, December 31st, 1906:—

Dr.

To Amounts written off:—	
Remuneration to directors	$ 15,000.00
To Dividend account:—	
£1.15, per share on 80,000 shares = £140,000 at 4s 6d	622,222.22
Bonus of £1 per share on 80,000 shares = £80,000 at 4s 6d	355,555.55
	977,777.77
To Dividend adjustment %:—	
Difference in exchange between 4s.6d. the rate at which the dividend is declared, and 2s.3⅛d the rate of the day	968,766.01
To Transfer to silver reserve fund	750,000.00
To Balance forward to next half-year	1,721,558.90
	$ 4,433,102.68

Cr.

By Balance of Undivided Profits, 31st December, 1905	$ 1,712,472.37	
By Amount of Net Profits for the Six Months ending 31st December, 1906, after making provision for bad and doubtful debts, deducting all Expenses and Interest paid and due	2,720,630.31	
		$ 4,433,102.68
		$ 4,433,102.68

Sterling Reserve Fund

To Balance	$10,000,000.00

	$10,000,000.00
By Balance 30th June, 1906 (invested in Sterling Securities).	$10,000,000.00
	$10,000,000.00
Silver Reserve Fund	
To Balance	$11,000,000.00
	$11,000,000.00
By Balance 30th June, 1906	$10,250,000.00
By Transfer from Profit and Loss Account	750,000.00
	$11,000,000.00

ANHUI RAILWAY

"Quietly and unostentatiously," says *Nan Fang Pao*, a well-informed Chinese newspaper, and characterized by strict business methods, "the Anhui Railway has been doing its work. With Lord Li Ching-fang as Director-General of the enterprise, assisted by a staff of men who know their business, the success of the railway is a foregone conclusion. Already the survey of the line has been completed to Ningkwofu, distant about 50 miles from Wuhu, and the engineers are now hard at work surveying the third section from Ningkwofu to Kuangtechou. The work of surveying has been greatly delayed owing to heavy rains.

"The land-purchasing officials have been busy in buying the land required for the railway, and they have made excellent progress in their work. No serious interference with graves or important buildings has been met with, and the difficulty of settling disputes and lawsuits with land grabbers and speculators has been conspicuous by its absence; as the people of Anhui appreciate the value of the iron road to their province and will not voluntarily place obstacles in the way. Already many of them, seeing the foreign engineers and their assistants hard at work in locating and surveying the line, have recognized the fact that the railway is a reality and will in the course of two or three years become a most valuable asset for promoting the commercial and material prosperity of their province. They have, therefore, shown considerable willingness to come forward to subscribe for the shares, and their former indifferent attitude toward the enterprise is gradually undergoing a change.

"The directors and the gentry, although fully alive to the present spirit of *China for the Chinese*, fear no complications or other consequences from the employment of foreigners, and have engaged several Norwegian and one Japanese engineer for the construction of their line. These foreign gentlemen have got on excellently with the Chinese in Anhui, and their relations with the directors and gentry are of the most cordial nature. There is absolutely no such thing as anti-foreign spirit observable in Anhui, so far as the experience of these foreigners goes. This proves conclusively the wisdom and sensible policy of the Director-General in daring to take a policy opposite to that of the directors of other provincial railways who insist on employing only Chinese engineers at fabulous salaries, far out of proportion to their ability and experience. Owing to the sensible policy of Lord Li, the Anhui Railway will prove a most economical undertaking and will serve as an example for other provinces to imitate. As soon as the railway materials, such as bridge-girders, rails, sleepers, etc., arrive next spring, the work of laying down the line and erecting the bridges will commence. The work of filling in the ground at the railway terminus for building workshops, warehouses and stations was commenced several months ago, and already considerable progress has been made. The report that the Anhui Railway is in lack of funds is hardly correct, as a large part of the required capital, Tls. 4,000,000, has already been subscribed, while the extra tax imposed on rice and salt exported from Anhui Province is yielding a substantial amount yearly.

"Altogether, the prospect of the Anhui Railway is very bright, certainly far more so than the same enterprises in the neighboring provinces."

PRECIOUS STONES IN SIAM

According to the *Siam Free-Press*, sapphires and rubies are the only gems the working of which is of any importance, in Siam, though spinels, zircons, garnets, and topaz are also produced to a small extent. Of the two forms of corundum, sapphires are very much more abundant and more largely worked than rubies. Siamese sapphires form a considerable proportion of the world's supply of this gem. Statistics, however, are not available, as there is no duty on the stones, and the work is carried on by numerous small parties of men and even by individuals, who dispose of their findings to a number of travelling traders.

Siamese rubies do not command a good price, as those of good color are mostly very small, while those of good size are of poor color. It is believed that any good stones which are found are sent overland to Burma and sold as Burmese rubies. As regards statistics, the same remarks apply as have already been made about sapphires.

Practically all Siamese sapphires come from the District of Phailin, in Battambong. Rubies are worked in a small way in this district, but the chief ruby workings are in Chantaboon and Kratt. The deposits are all alluvial, work being usually carried on by digging numerous small pits in the neighborhood of streams, the gem-bearing earth being washed by hand in the streams. Most of the work is in the hands of Burmese and Shans, who, however, employ a considerable number of Laos as laborers.

The gem-buyers are Burmese, Shans, Singalese, and natives of British India, and some European firms in Bangkok take a share in the trade.

The gem-mining districts are, for the most part, exceedingly unhealthy, which fact is a great bar to European enterprise in this line.

RAILWAYS IN MANCHURIA

The British Commissioner of Customs recently sent to Fengtien to take charge of the establishment of Custom Houses at Mukden and Antunghsien, has presented a memorial, according to the *China Times*, to the Tartar General at Mukden, suggesting the immediate extension of the Imperial Railway of North China from Hsinminfu to Fakumen, which places are about 55 miles apart, to facilitate foreign and native trade in Southern Manchuria. He states that by building this section, merchandise from Peking, Tientsin, and other places inside the Great Wall, can be transported direct to Fakumen for reshipment to Kirin and Heilungkiang, while the products in the District of Liaohsi, west of the Liao River, can be sent to Tientsin, etc., in exchange without trouble. Otherwise all products traffic in the Liaotung and Liaoshi districts will come into the hands of the Japanese who can send them to Japan and other places *via* Tairen. This proposal is favored by the Tartar General, who will soon apply to the proper authority for funds to carry it out. The commissioner also stated that in connection with the reorganization of trade in Manchuria, especially in Fengtien, which is the wealthiest and most important of the three eastern provinces of Manchuria, it is absolutely necessary to effect the following reforms without delay:—

(1) To construct broad roads in important places in Southern Manchuria, such as Mukden, Fakumen, Hsinminfu, T'iehling Paioyang, etc., in foreign style, to facilitate the transport of foreign and Chinese merchandise by carts and other vehicles. After the completion of the broad roads, a Department of Public Works should be established at Mukden, or some other central point, to take charge of them so that they may be repaired or rebuilt from time to time in case of need, under supervision of experienced foreign and Chinese officials. By the construction of these roads, not only will the trade in Fengtien be much improved, but in case of hostilities, the Chinese authorities will find it much easier to transport their military forces.

(2) To dredge the shallow parts in the Liaoho, which is the only inland waterway in the Province of Fengtien suitable for the navigation of steamboats and junks for transporting merchandise, so that steamboats and Chinese cargoboats may navigate it without difficulty. After dredging the river, the Chinese authorities should reduce the river and boat tax as an encouragement to Chinese boatmen; then the convenience of navigation in the Liaoho will become equal to the transport of freight by rail.

(3) As the greater part of the foreign and native merchandise in Fengtien is transported by carts drawn by horses or mules from one place to another, and in view of the heavy charges for horses and mules lately, it is urgently necessary to devise means to encourage Manchurian natives and Mongols who are owners of large herds of these animals, to bring them to Fengtien for trade purposes, otherwise the commerce of Southern Manchuria will be much hindered, because now the charges for horses, etc., are five or six times higher than they should be.

COAL LOADING, NEW SOUTH WALES

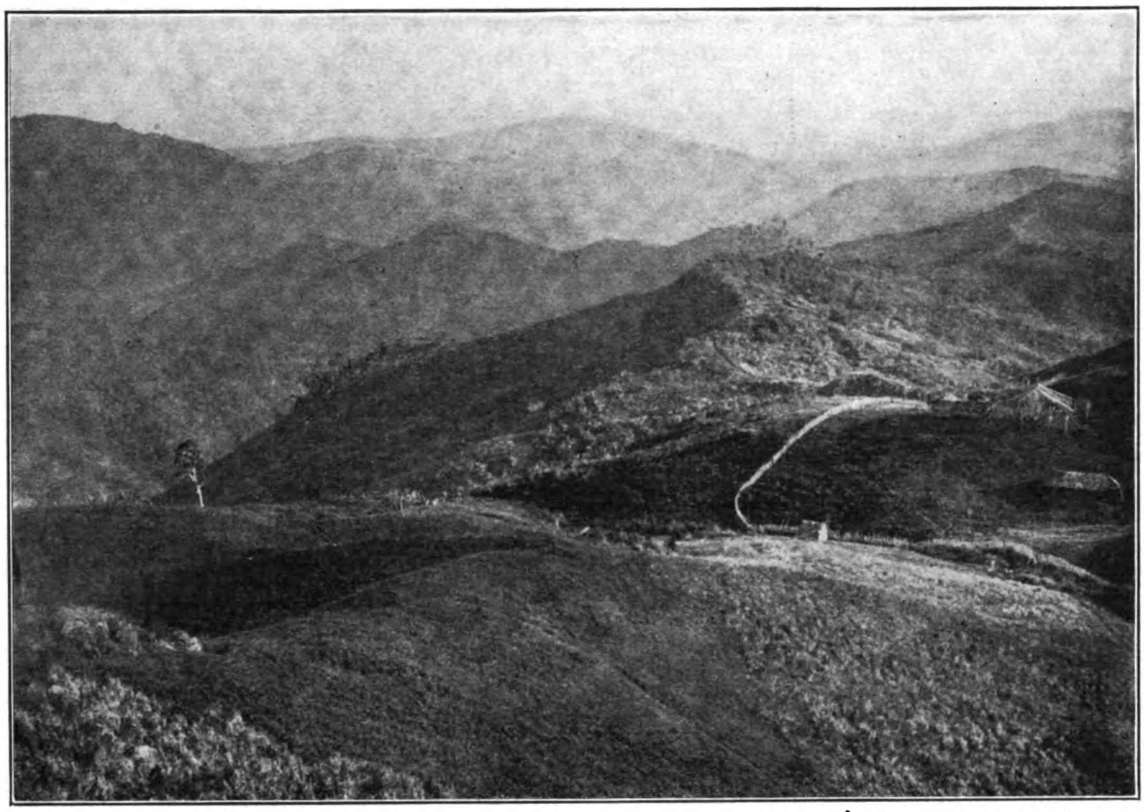
Writing from Newcastle, Mr. F. W. Goding, American Consul, says that experts have recognized for some time that the appliances for loading vessels with coal in that port of Australia were antiquated. As an instance, in England the coal cars with a capacity of 15 tons are so manipulated that 500 tons per hour are loaded at each berth, while in America 2,000 tons per hour is usual. In Newcastle 1,000 tons of coal per hour are loaded at 18 berths, showing how far behind the system is. The engineer in charge has evolved a system of gravitation which will allow vessels to be fed without cessation or interruption until loaded. Under this system 40 or more coal cars, of an average capacity of 7½ tons, will be unloaded at each crane per hour, two cars being handled at the same time. This means that a vessel will be fed at the rate of 640 tons per hour at each crane instead of 80 tons per hour as at present. There is a strong probability that the capacity of the coal cars will be increased to 15 tons in the near future, which would allow the handling of 1,200 tons per hour at each berth, reducing the cost of loading coal at this port by 20 per cent. The Government is determined to bring the system of loading coal at Newcastle up to the highest point of efficiency, in which effort all those having any connection with the commercial interests of the port heartily second.

MALAY WOMEN AS GOLD MINERS

Under a recent order made by the Resident, the royalty payable on alluvial gold won by persons working under individual mining licenses in the State of Pahang, F. M. S., has been commuted for a fixed payment of $5 a person a year, half rates being paid for six months or less. This alluvial industry—which is confined chiefly to certain villages along the trunk road, such as Budu, Sega, Tanjong Besar, and Benta—is, according to the *Pinang Gazette*, assuming fairly extensive proportions. A feature of the work is that large numbers of Malay women are engaged and are keener on it than the men. They take great pains to wash carefully selected sands for small quantities of gold. The ore so obtained is seldom or ever exported, being either made into rough jewelry or sold to local Chinese instead. Another form of primitive mining, favored by kampong Malays in many parts of the Ulu, is called *meriau* or *melanda*. Like the fossicking for alluvial gold, it consists of washing the sands of selected river beds for tin ore, and here again the women are much in evidence and do more of this kind of work than the men. With a little luck and some perseverance, a fair quantity of ore is usually won in this way, from 50 cents to a dollar's worth being obtained by one worker in a day, which is ample for the average Malay family to live on, and have something over, even if but one person of a household went to *melanda*.

Physiography of the Island of Cebu, Philippine Archipelago

[Coal-fields are at present being developed on the Island of Cebú and indications point to practically inexhaustible and valuable returns. Messrs. J. G. White & Co., Inc., engineering contractors for the Philippine Railway Company, are opening up large deposits of good lignite coal at the Cariñdad mines, for use on the railroads of Panay, Cebú and Negros, now under construction. Mr. D. M. Carman and other promoters are also developing promising deposits, and the analyses of the Compostela coal have been quite satisfactory. Cebú is just now the most promising coal district in the Philippines, so the following condensation of a paper by Mr. Warren D. Smith, Government Geologist, dealing with the physiography of Cebú and published in a recent issue of "The Philippine Journal of Science," should be of interest in view of the fact that one of the greatest economic problems in connection with the promotion of railroads in this part of the Philippines has been the matter of fuel; then, again, a bountiful coal supply, at a reasonable market price will insure industry along the railroad lines.—EDITOR'S NOTE.]



VIEW OF A PORTION OF THE "CORDILLERA" FROM CAMP WALKER; ELEVATION ABOUT 3,000'

The core of the Island of Cebú is largely plutonic rock, in some places felsitic, almost a typical basalt; elsewhere a diorite, and again very much like a granite. This igneous rock is found in all streams cutting any of the three ranges shown in a cross section of the island. A very blue, hard, and extremely fine-grained variety constitutes Mount Maupa, one of the landmarks of Cebú. This mountain with a conical top rises above the range of which it is a part and is very conspicuous from the sea. Locally it is referred to as the *Sugarloaf Mountain.* A porphyritic rock, which is a hornblende-andesite, is seen in the vicinity of Compostela, on the tramroad to the group of mines back in the hills. A conglomerate of varying thickness succeeds above the igneous complex. This conglomerate is always present and seems to be conclusive proof that the igneous rock is not of the nature of an intrusive mass. Were it such, the difficulties of mining might be increased enormously.

Stratigraphically, above the conglomerate comes a series which is very difficult to demarcate and to separate into its integral parts. It comprises alternating beds of shale, sandstone, and limestone, generally unfossiliferous. Above this comes the coal measure proper, consisting of a gray shale at the base, thickness unknown, a black, thick coal occurring in at least two seams, the first averaging 1.5 meters in thickness, although greater thicknesses have been reported; this is followed by a firm, yellowish-gray, seemingly unfossiliferous sandstone; above this lies a second seam of coal varying from 30 centimeters to 76 centimeters. This is of a much inferior grade, being characterized by shale and slate partings. Above this latter seam is a bedded limestone.

In the vicinity of the Guila-Guila property, at the headwaters of the Mananga River, there is a limestone formation which is extremely rich in the genus *Orbitoides* (Lepidocyclina), a further study of which forms may be shown to be *Lepidocyclina insulae-natalis* Jones & Chapman, or closely related to that form from the Miocene of Christmas Island. This limestone appears unquestionably to be upper Miocene, equivalent to the *Gaj of the Sind*, India. At one point, in a cutting on the Danao tramroad about two kilometers below the old mines, limestone probably containing nummulites is found. This limestone appears to be unconformable with and below the orbitoidal beds.

"LA CORDILLERA CENTRAL."—The *Cordillera Central* may be said to form the backbone of the Island of Cebú. It extends north and south, corresponding to the long axis of Cebú and also to one of the main tectonic lines of the archipelago. Its greatest elevation does not, in all probability, exceed 1,000 meters. It is partially wooded and almost without inhabitants; the only human beings to be found there are scattered bands of *ladrones*, or *pulajanes*, as they are locally termed, and the *constabularios* who hunt them. Wild and almost inaccessible, underlain by igneous rock which does not support a very flourishing flora, a region of pronounced relief, it is not very enticing even to the geologist, and the native avoids it as he would the plague (see illustration showing a portion of the *Cordillera* country).

Although the total elevation, for a mountainous country is not great, the relief of Central Cebú is exceedingly pronounced. There are two reasons for this: the first and chief one being the short, horizontal distance to sea level, which enhances the declivity, and the second, the scarcity of vegetation. These conditions are favorable for the development of steep profiles and V-shaped cross sections in the streams. Nevertheless, outcrops are few and the talus is very heavy on most of the valley walls. In some isolated portions there is still a capping of coralline limestone which gives a more or less even crest to the range, but where this is absent, as in the region of Mount Maupa, about 30 kilometers southwest of the City of Cebú, the outline is serrated.

The main folding in the island has taken place in an east-west direction, so that the axis of the folding runs north and south. The effect of this is to give the streams in the vicinity of the *Cordillera* a north and south direction. At their sources they may be east and west and the same may be true farther down, where they turn again to cut at right angles through the foothills. There is a minor cross-folding north and south which somewhat modifies this arrangement of the drainage and which also causes the frequent sags in the high line of the central portions and the complete dying out of the ridge to the north.

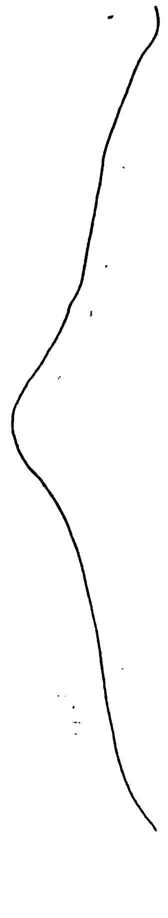
INTERMEDIATE UPLANDS.—The intermediate uplands include all the elevated region between the *Cordillera* and the costal plains. The surface rock is for the most part either limestone or marl, in some places sandstone or a coral sand formation. The geological events which have transpired to bring about the resulting features of this upland country are many and have been quite complex. In the first place, the older sedimentaries were profoundly folded and probably also much faulted; in the second, erosion set in and truncated many of these folded beds; in the third, subsidence occurred and a coralline mantle was laid down upon these truncated folds, and in the fourth, the whole region received a thrust from below in which elevation took place, but it was an unequal elevation, with tiltings east, west, north, and south. The north and south tilt, which, however, may be decidedly more recent than the east and west one, is best seen in the vicinity of Argao, where the marine terraces incline to

the north at an angle of about five degrees. The even sky-line of the central part of the island no doubt results from the peculiar growth of coral reefs, which grow up to a limiting plane, the surface of the water, and the coralline mantle has suffered but little tilting in the region of the *Cordillera*. In the lower regions the even sky-line is still well preserved in many places, but the tilting is marked.

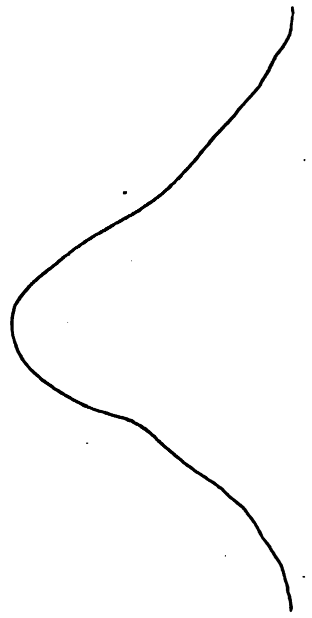
Mr. Bailey Willis's brief discussion of his physiographic studies in Europe, appearing in the *Fourth Year Book* (Carnegie Institute, 1905), suggests possible explanations for some of these phenomena, and the Carpathian type of mountains, with their peculiar physiography, namely, folded Neocene strata subsequently tilted and warped with sink holes, seems to find an analogy in Cebú. Mr. Willis also emphasizes the fact that the ***growth*** of mountains is distinct from the existence of 'mountains by virtue of this structure, while on the other hand it appears that those of Cebu have *grown* rather than that they are due to inherent structure, for were it not for the great subsequent erosion, one might start from the coast and climb toward the *Cordillera* without being aware of anything more than a moderate ascent, for is is the after work of the streams which hat made Cebú appear to be mountainous. The illustration showing the dissected upland country in the region of the Compostela coal-fields shows what this work has been; indeed, the similarity of this region with the Benguet country of Northern Luzon is quite marked, although in reality its elevation is from 2,000 to 3,000′ less.

Extended sections are rare, but one in Butuanon Creek was photographed, showing the local warping in the Pliocene limestone (see illustration of warped limestone in Butuanon Creek).

HANGING VALLEYS.—The phenomenon of hanging valleys is not by any means common in Cebú, but there are two or three quite remarkable examples. One is found on the west coast, in the vicinity of Barili, where there is a beautiful waterfall of about 50 meters, and another, much more typical, in the Guila-Guila country where the Bocanit drops off the upland country into the valley of the Mananga, about 250′ below. The outcrop near the top of the wall is a limestone, very rich in *Orbitoides*. The underlying rock is igneous; although the higher valley is still young, there is a marked difference between the cross sections of the two, the upper one being more on the following order:—



The lower one is a typical cañon, and is diagramatically sketched as follows:—



It is not believed that any unusual series of events, other than a rather rapid rate of elevation, are responsible for this phenomenon. Evidences of elevation are abundant throughout the whole length of Cebú.

Another factor might be suggested as having played some part in producing the great difference in these two valleys, namely, the quantity of water available for the work of erosion on the plateau and in the deeper valley. The country rock underlying the highlands is limestone, abounding in sinks and cracks, so that meteoric waters do not gather so well into streams and hence do not become available for degradational work. On the other hand, the lower stream taps all or at least a large part of the underground water from the overlying formations, besides gathering the contributions from the higher stream itself.

An accompanying illustration shows the cañon-like appearance of the Mananga just below the point where the Bocanit enters, and also the men at work constructing the new Cebú-Toledo Road and the difficult nature of this work. In the Philippines it is absolutely imperative that the roads should be built well above the highest water of these mountain streams and also high enough so that the rock on the upper slopes shall be reduced to a minimum.

The uplands of Cebú do not support as large a population as one would suppose to be the case in many portions, chiefly in the center ones; the natives live huddled in squalid barrios or reconcentration camps. Corn is the principal product, but even this crop is cultivated in a sporadic, half-hearted, and primitive way, nature being relied on to do the larger part of the work. An accompanying illustration gives a view of typical upland country in the region of the Compostela-Carmen coal-fields.

COVES.—The best land on the island of Cebú is to be found in the valleys of such streams as the Pandan, Jacupan, Carmen, etc. These meander through beautiful, broad, flat-bottomed valleys, the level of the valley floor being usually not over 50 meters above the sea; they are often roughly circular in outline, and in nearly every case the stream which occupies the valley issues from it through a narrow cañon-like cut in an igneous formation which acts as a barrier. The accompanying diagram will probably convey a better idea of the relations pertaining to these valleys.

The process of formation is analogous to that of a mill pond in a stream. Instead of there being a damming up of water, there is a ponding, as it were, of silt and degradational material brought down by the stream, and so a local flood plain is formed. In these coves the streams have every appearance of old age, with meanders especially well developed. There are flood plains, but not flood plains usually thought of—that is, the ones produced by material deposited during times of overflow. They are formed largely as a result of *lateral planation*. The importance to agriculture of this process whereby a stream works back and

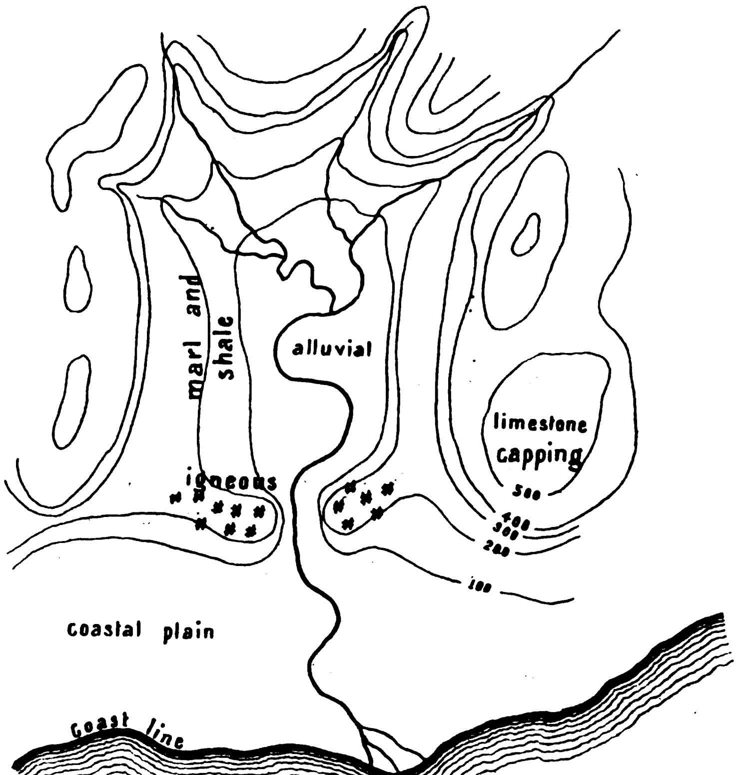
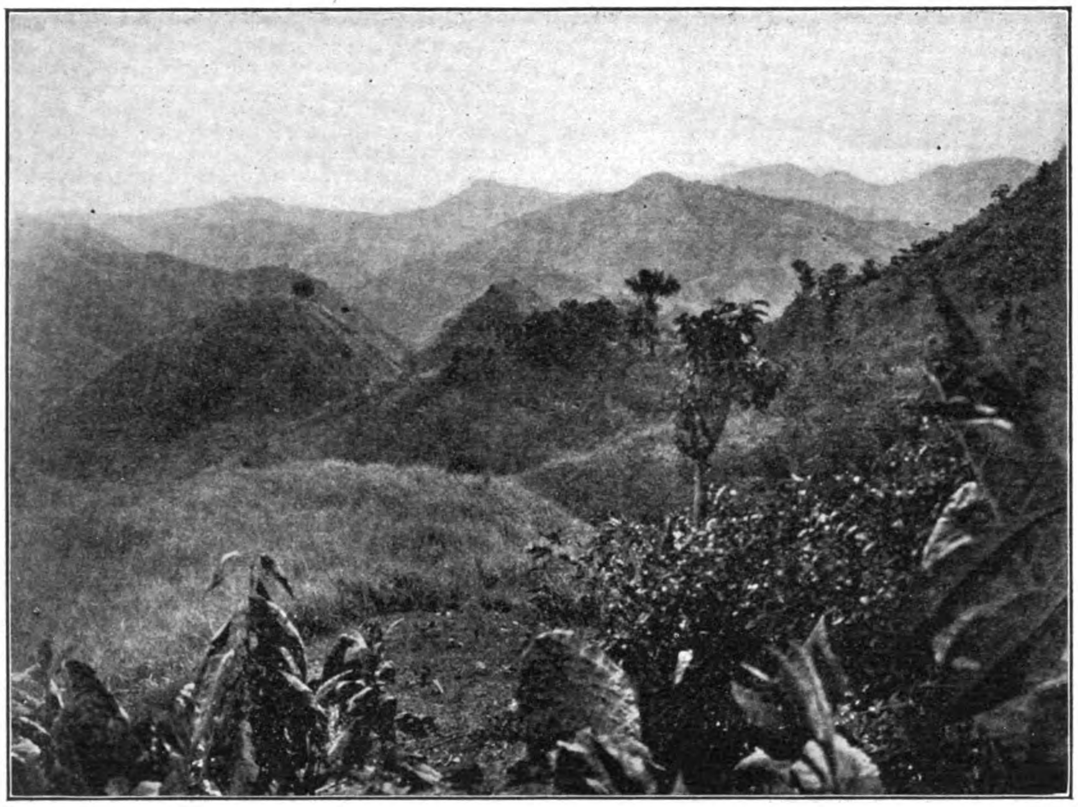


DIAGRAM OF VALLEYS ON ISLAND OF CEBU



DISSECTED UPLAND COUNTRY IN THE REGION OF THE COMPOSTELA COAL-FIELDS

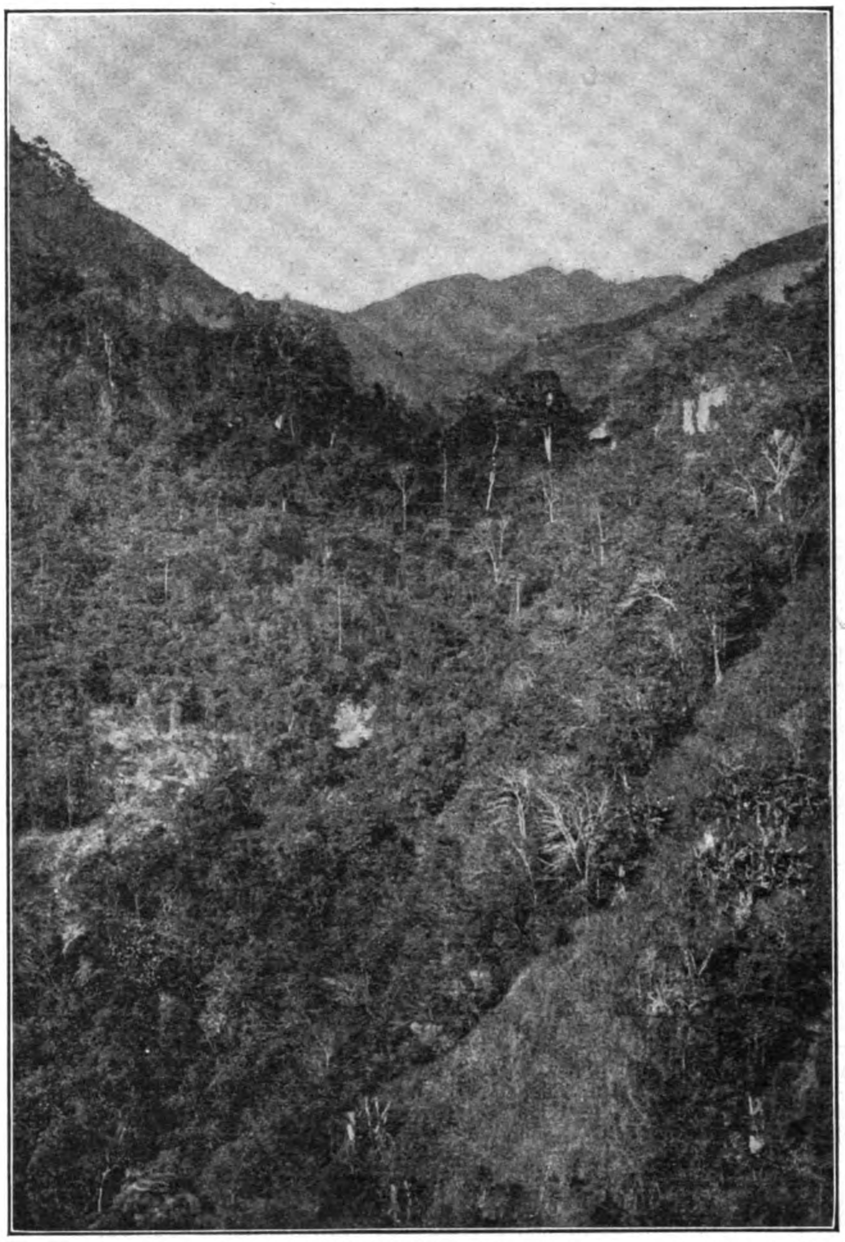
forth over a tract of land, can not be overestimated. In these coves all the contours are gentle and rounded, save at the lower ends, where the streams usually issue through picturesque gorges. Just as the scenery of the *Cordillera* is wild, rugged and forbidding, so here is it mild, domestic, and inviting (see illustration of the Carmen Valley).

COSTAL PLAINS.—Cebú, throughout the most of its extent, has remarkably little costal plain, and yet it is this exceedingly narrow and interrupted strip which supports her proportionately enormous population. It has a foundation of coral reef on which has been deposited the débris of the hills, Piedmont River deposits. In this débris is material from the decay of all manner of rocks—diorite, andesite, basalt, sandstone, and limestone—through and over which the streams have worked their way from the highlands to the lowlands. The gathering together of all these constituents in the plain soils has rendered them very rich, as they consist of many varieties of elements. This raised shelf is, likewise, a result of manifold processes of building. With a foundation of coral rock, these plains have been constructed by deltas, alluvial fans of the rivers coming down from the mountains, and by the work of the sea, as is manifested by bars and spits. Undoubtedly much of the planeness of this lower country has been produced by wave cutting. This plain has not a perfectly even and uniform surface, because all these different agencies have left on the topography their mark which time has not entirely obliterated.

To make a critical study of the costal plain, its mode or modes of origin must be reviewed. As islands in regions of volcanic disturbance, as in the case in the Philippines, emerge from the sea, usually with little or no costal plain, a hypothetical case may be resorted to to show the nominal course of development of such a plain.

It is shown by the survey that while there is a shifting of material from the highlands to the sea-border, there is no diminution in the bulk of the mass, but only a change in the form. It is also shown that the portion between the levels of high and low water approaches more nearly a true plain, for along this belt the waves, tidal or otherwise, are continuously at work leveling down any irregularities. Beginning from here, in either direction, towards the shore or towards the sea, the profile departs greatly from the horizontal. If the island were gradually to subside, the water would encroach on the land and the waves would tend to plane off the latter, carrying the horizontality of the profile curve farther and farther inland. If, on the other hand, the island was rising, the plain would grow seaward and there would be little change in the upper portion of the profile. If reefs were forming around the island, which is rising at the same time, the growth of this platform seaward would be greatly quickened. Coral reefs make ideal foundations upon which to build a plain, because they grow up to a limiting level, namely, the surface of the water. When the coast becomes sufficiently elevated to bring these reefs above the water, already there is a flat surface which usually has a very slight slope towards deep water.

WARPED LIMESTONE IN BUTUANON CREEK



HANGING VALLEY OF THE BOCANIT VIEWED FROM ACROSS THE MANANGA CAÑON

At the edge of this coral platform, the slope is very sudden and very great, though just at the edge the reef is slightly higher, the result of wave action, no doubt. For the most part the costal plain of Cebú is of this origin. This is well seen by an examination of the plain north of the City of Cebú, just west of Mabolo, and in the neighborhood of Mandaue.

Rivers build many parts of typical costal plains in the form of delta deposits. The best example of this class of formation which Cebú affords is probably the one of Argao. A delta deposit may be distinguished sometimes by its triangular shape and always by its peculiar cross section in which two series of beds can be seen. In a lower portion of a section of sufficient depth, layers are seen to dip at rather high angles, whereas above these lines is a series which is more nearly horizontal, or to be exact, which has the same gradient as the stream itself. The streams, as elevation continues, will be engorged in their old delta, while they build new ones farther out to sea.

Mananga River.—The Mananga is typical and, as an example, will be discussed separately. A critical, physiographic study of this river from its source in the *Cordillera* to the sea, is most instructive. It is selected because it is easily reached from the City of Cebú, and it presents nearly all the features of interest pertaining to the other streams of the island.

Where it rises in the *Cordillera* the declivity is at a maximum, and therefore the numerous tributaries are short, comparatively straight, and join the main stream at right angles. The latter is oriented north and south because it follows the syncline in the limestone. In this part of its course it is a structural stream. Its valley is broad and shallow, in striking contrast to the conditions of its lower course.

At the boundary between the older limestone and the igneous formation, the stream swings sharply to the east and makes its tortuous way across to the younger limestone. In traversing the igneous formation it flows at the bottom of a deep and narrow cañon, winding back and forth to avoid the harder phases of the volcanic rock, which within short limits varies greatly in physical and chemical composition. In this portion of its course the Mananga would be called an antecedent stream—that is to say, it keeps the general direction it had when it was on the limestone which overlies the igneous rock. In the former part of its course it was a *consequent* stream, flowing to the east as a *consequence* of the slope of the formations. Having become well intrenched, it worked down to the basement rock or became superimposed upon it, without having its general direction changed.

When the Mananga finally leaves the igneous rock it again becomes a *consequent* stream. In this lower portion its valley once more widens to a very broad, fertile, cove-like area, the Valley of Jacupan. A local change in the character of the limestone formation, which being largely coral sand becomes very soft, and the occurrence of marl deposits account for this.

Still farther down is the gravel and sand plain near the sea, where the once vigorous and eroding stream is sluggish as it passes across old, dead, coral shelves finally to dip into the Mactan Sea. In no portion is the Mananga navigable even for bancas. In fact, this lack of depth is true of all the streams of the island, the condition principally being due to lack of sufficient feeding ground to support large streams, to limited plain country, and to the character of the rocks. The lack of certain classes of vegetation offers an added factor. The absence of even one good, navigable stream connecting the coast with the interior produces a profound difference in the economy of the people.

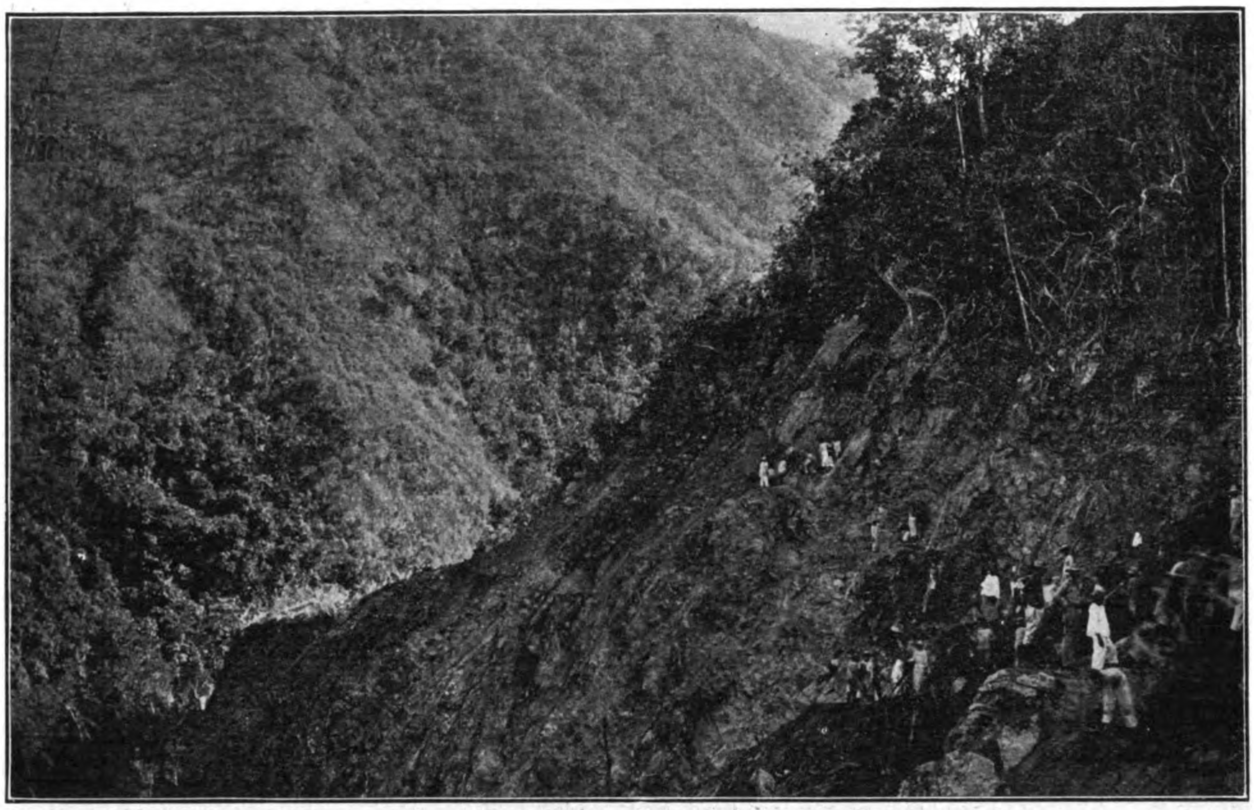
Economic Relations.—As has been mentioned above, the *Cordillera* region is an undesirable abode for human beings. It affords little in the way of sustenance, its esthetical influence passes over the heads of hungry and hunted beings, the very streams seem to leave it in haste, and the luxurious vegetation of the lower country does not aspire to it. The *molave* and *narra* are prominent among the trees. Neither do the uplands support the life expected of them. Here the physiography is not so much against the existence of human beings as is the geology. The underlying rock in the uplands of Cebú is largely limestone, as is the case in the other region cited, but the lime of these rocks does not remain to form a constituent of the soil. It is readily soluble and passes down the streams to be deposited on the lowlands as travertine and other deposits, or eventually to reach the sea.

Very little rice is grown in these bottom lands, because of one important feature of the soil. One might argue that the reason is not a physical one, but is purely arbitrary because the *hacendero* prefers sugar and corn to rice, but when it is remembered that rice is really more needed in these Islands than sugar or corn, and that thousands of piculs are imported every year to supply the deficiency, it will be seen that there must be another cause for this lack. This is found in the fact that rice needs an impervious substratum to hold the water with which the paddies must be flooded, and this is almost entirely lacking in the valley areas of Cebú.

Although Cebú is the largest hemp depot south of Manila, comparatively little abacá comes from this island. A recent investigation has shown that potash is a large and important constituent in the fiber and juice of the abacá, more being contained in the juice and fiber than in the waste, and as we find the potash content to be high among the mineral values of this plant, we may argue that it requires such a high amount as a requisite for its growth. A fairly exhaustive search over the island and a microscopical examination of a large number of the rocks from Cebú have shown them to be remarkably deficient in potash-bearing minerals. On the other hand, it can be demonstrated that the rocks from the well-known abacá districts are of a class which contain a considerable percentage of potash. It is not for a moment contended that other factors, such as drainage, humidity, etc., do not have much to do with this question.

Almost nine-tenths of Cebú's great population is to be found on the alluvial plain, and here the chief products are rice and coconuts. The soil in this situation is admirably adapted to rice culture, as the stiff paddy clay holds the water around the roots of the plants, but, nevertheless, this crop is not as extensively grown as it might be. The coconut flourishes along the littoral.

Cebú, from the time of the landing of Magellan, nearly 400 years ago, has been a land of trouble. That the human factor, the native and also the European, has played a part in fostering these conditions can not be gainsaid, but there are far deeper causes, which are material, physiographic, and geologic, matters of environment, peculiar to islands and especially peculiar to Cebú, which have played their part. These causes are as follows, especial stress being laid on the order in which they are given:—(1)

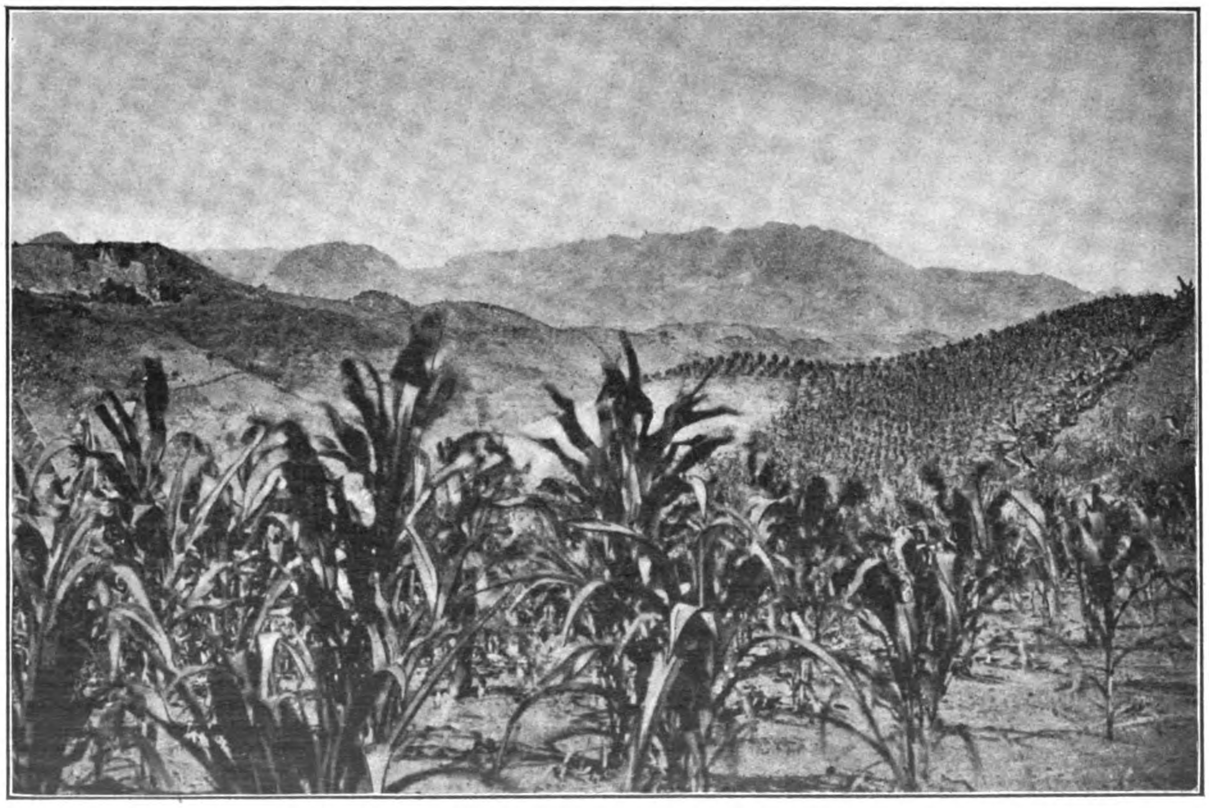


MANANGA CAÑON, SHOWING WORKING PARTY ON THE NEW TOLEDO-CEBÚ ROAD

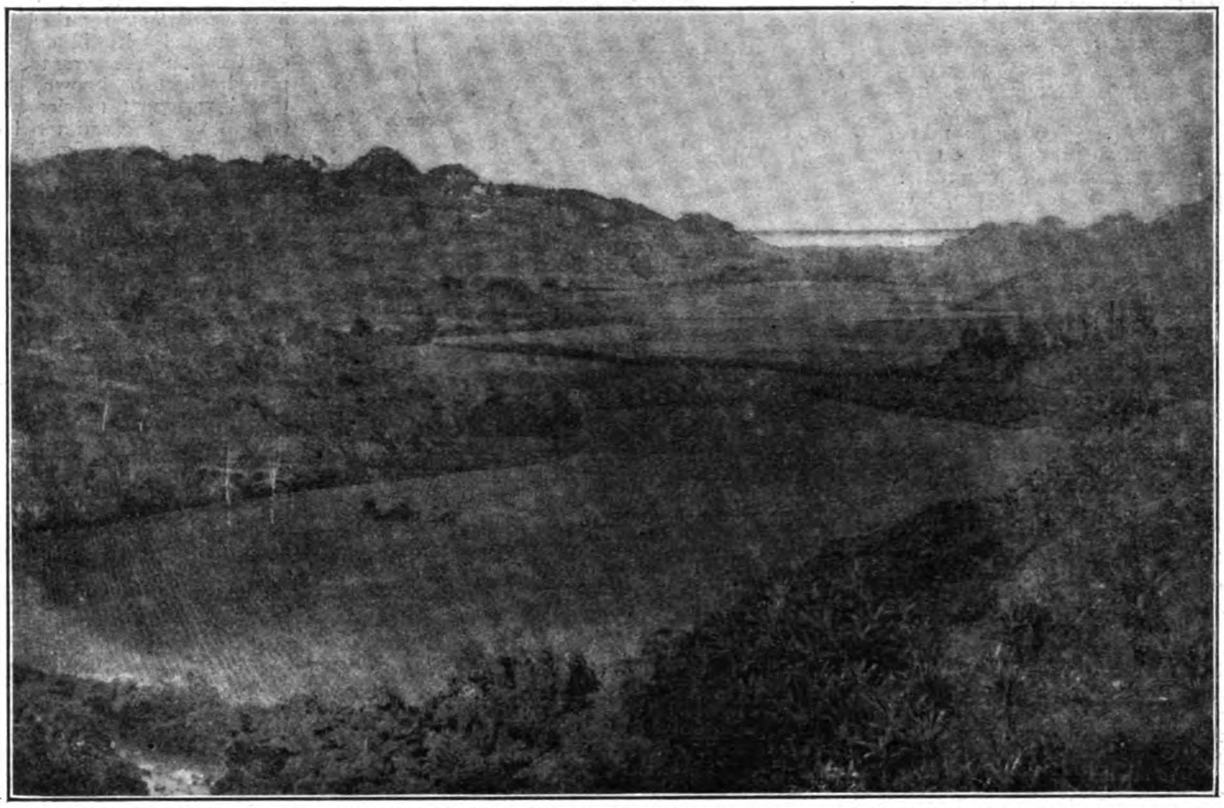
Tropical climate, (2) great population, (3) island habitat, (4) mountainous interior with narrow and interrupted coastal plain.

It has been pointed out that the *Cordillera* is unfavorable as an abode for man; that the uplands, to support a population, require strenuous and improved agricultural methods; the coves are in the hands of a few. Owing to the physiography, therefore, the native must live at the coast, or, in other words, he is not encouraged to leave the sea and to go very far into the interior to take up agricultural pursuits. An accompanying cut shows a portion of the coastal plain with the mountains rising abruptly back of it. The city in the foreground is Cebú.

It is a well-known fact that the more primitive a people the smaller is the number which can find subsistence on a given area. For instance, the little Kingdom of Saxony can support an enormous proportion per square mile, but many factors, such as division of labor, the great number of vocations in life which spring with an advanced civilization, the facilities for bringing in food stuffs from the outside, etc., make this possible. In more or less primitive communities, each individual requires a large range, to borrow a biological term, because each one procures his or her own daily subsistence. This oftentimes necessitates miles of roaming on sea and land. Just as this fact has led to conflicts in the past, and still causes them in the lower animals, so it will today in the higher communities. Example after example might be given where whole groups have become extinct because of these factors, but one will be sufficient. In Jurassic times in North America



ANOTHER VIEW OF THE UPLAND COUNTRY WITH MOUNT MANGILAO IN THE BACKGROUND



FERTILE CARMEN VALLEY LOOKING EAST; NOTE THE MANTLE OF CORAL LIMESTONE ON THE DISTANT HILLS

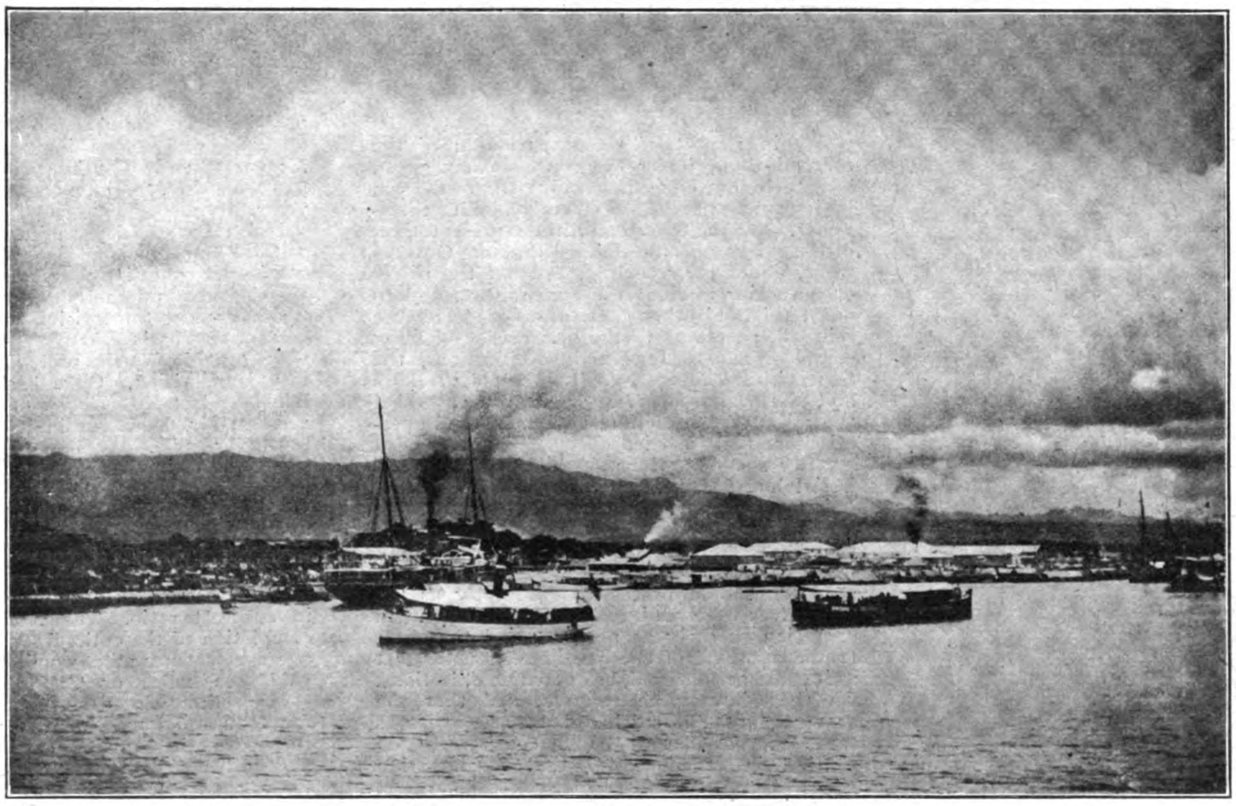
there lived the great and strange group of mammals known as the Dinosaurs—these were of such prodigious proportions and required such extensive ranging grounds (they were both herbivorous and carnivorous) that they became a menace to themselves. They disappeared because of their very unwieldiness, their own strength and power finally working toward their downfall.

The trouble in Cebú is largely economic, and is a result of material causes. Physical factors such as have been outlined are deep seated and have been at work before governments and human laws were instituted. Naturally, the solution of the problems presented in this island lies in the reduction of the individual range, in division of labor, in putting into motion the host of units, human and material, now unorganized and idle. There is no danger, as it was once thought, that the community of interests, the introduction of machinery, etc., will cause some to be pushed to the wall in the economic struggle.

With these will come new vocations, not known before, and they will be largely industrial, thus leading the native out into ever-widening circles of experience and larger and larger spheres of influence.

To accomplish these things it will not be necessary for him to leave his natural home, but he must study the things about him—the topography of his country, that he may control economic conditions; the streams, with a view to utilizing their water power; the strata of the earth, to mine from them mineral wealth; the soil, that he may get the most from his crops.

With economic conditions in a settled state, and that means a healthy state—the social and political phases will settle themselves.

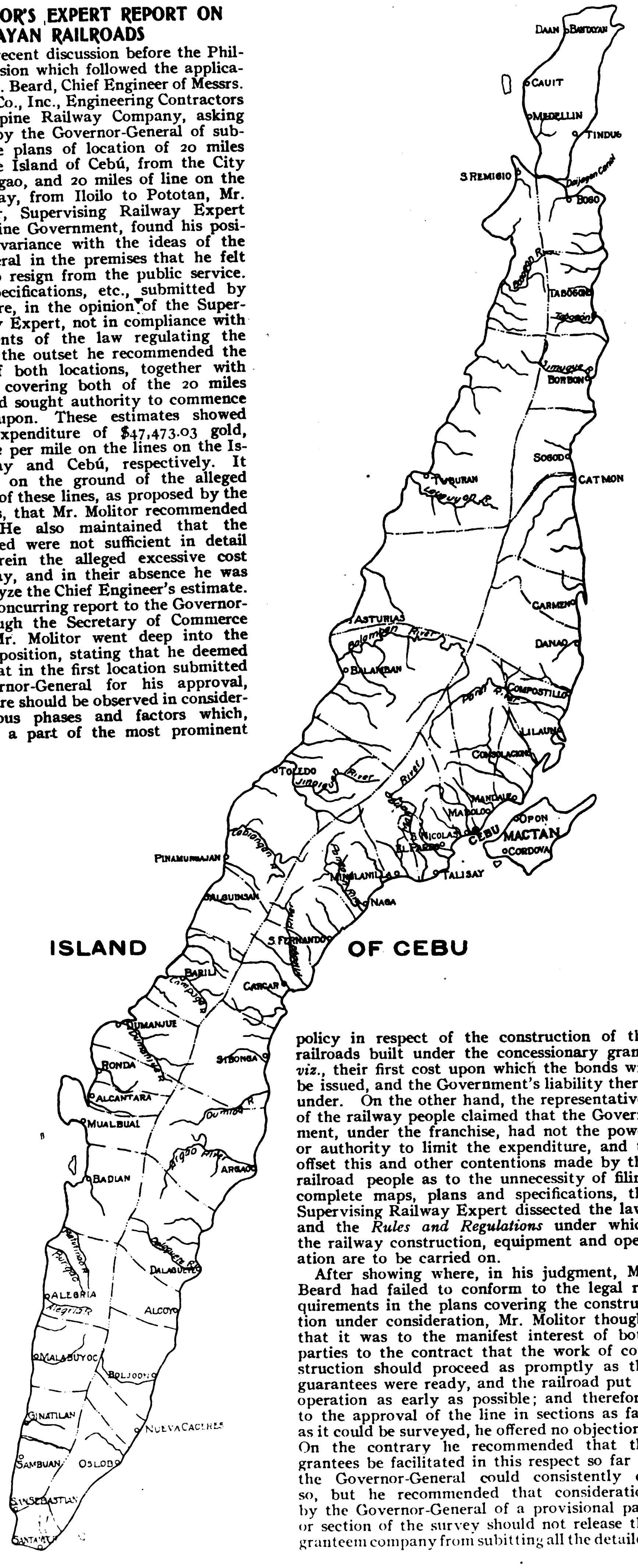


PORT OF CEBÚ, SHOWING TOPOGRAPHY OF THE COUNTRY INMEDIATELY BACK OF THE CITY

MR. MOLITOR'S EXPERT REPORT ON VISAYAN RAILROADS

During the recent discussion before the Philippine Commission which followed the application of Mr. E. J. Beard, Chief Engineer of Messrs. J. G. White & Co., Inc., Engineering Contractors for the Philippine Railway Company, asking the approval by the Governor-General of submitted definite plans of location of 20 miles of road on the Island of Cebú, from the City of Cebú to Argao, and 20 miles of line on the Island of Panay, from Iloilo to Pototan, Mr. F. A. Molitor, Supervising Railway Expert of the Philippine Government, found his position at such variance with the ideas of the Governor-General in the premises that he felt called upon to resign from the public service. The plans, specifications, etc., submitted by Mr. Beard were, in the opinion of the Supervising Railway Expert, not in compliance with the requirements of the law regulating the same, and at the outset he recommended the disapproval of both locations, together with the estimates covering both of the 20 miles that Mr. Beard sought authority to commence construction upon. These estimates showed a proposed expenditure of $47,473.03 gold, and $46,934.72 per mile on the lines on the Island of Panay and Cebú, respectively. It was primarily on the ground of the alleged excessive cost of these lines, as proposed by the concessionaries, that Mr. Molitor recommended disapproval. He also maintained that the plans submitted were not sufficient in detail to show wherein the alleged excessive cost of the lines lay, and in their absence he was unable to analyze the Chief Engineer's estimate.

In his non-concurring report to the Governor-General, through the Secretary of Commerce and Police, Mr. Molitor went deep into the details of his position, stating that he deemed it essential that in the first location submitted to the Governor-General for his approval, the greatest care should be observed in considering the various phases and factors which, he held, form a part of the most prominent



policy in respect of the construction of the railroads built under the concessionary grant, *viz.*, their first cost upon which the bonds will be issued, and the Government's liability thereunder. On the other hand, the representatives of the railway people claimed that the Government, under the franchise, had not the power or authority to limit the expenditure, and to offset this and other contentions made by the railroad people as to the unnecessity of filing complete maps, plans and specifications, the Supervising Railway Expert dissected the laws and the *Rules and Regulations* under which the railway construction, equipment and operation are to be carried on.

After showing where, in his judgment, Mr. Beard had failed to conform to the legal requirements in the plans covering the construction under consideration, Mr. Molitor thought that it was to the manifest interest of both parties to the contract that the work of construction should proceed as promptly as the guarantees were ready, and the railroad put in operation as early as possible; and therefore, to the approval of the line in sections as fast as it could be surveyed, he offered no objections. On the contrary he recommended that the grantees be facilitated in this respect so far as the Governor-General could consistently do so, but he recommended that consideration by the Governor-General of a provisional part or section of the survey should not release the granteem company from subitting all the detailed maps, profiles, specifications, etc., required by law. In his opinion it was essential that each and every item required under the *Rules and Regulations* for the filing of maps should be complied with in order that the class of construction the grantee company contemplated might be known, as well as to enable the Government to clearly and definitely ascertain why the estimated cost ran into such alleged excessive figures.

As evidence of the necessity of this data several details of the estimate were cited, which, unaccompanied by plans and specifications, left Mr. Molitor wholly in the dark. Sections and Tool-Houses, Shops, Engine-Houses and Terminals, Fuel-Stations, Docks and Wharves amounted to $2,590 gold per mile, or $103,609 for the 40 miles submitted, which would amount to $777,000 gold upon the entire system of 300 miles. In other words, the railway people submitted nearly $800,000 worth of construction in their estimate, unaccompanied by any plans or specifications to enable the Government to determine the character and kind of building they proposed spending this money for. The Supervising Railway Expert said that such analysis of the submitted estimate as he was able to make indicated that many of the items of construction were estimated upon a reasonable, equitable, and fair basis. For instance, most of the track items were conservatively estimated, as, perhaps, were the bridge and culverts. The grading, however, was, in his opinion, estimated too high in unit prices. As to the quantities, he was unable to determine them in the absence of more complete information. An examination of other items in the estimate, in which no plans were required to form a conclusive opinion, developed to Mr. Molitor the following:—

Right-of-way and Real Estate indicated an estimated price per acre of $26 gold, or $64.25 per *hectare*. He was unable to state whether this was excessive or not.

Legal Expenses at $130 gold per mile, covering the entire railway lines on a basis of three years' work, amounted to $39,000, or $13,000 *per annum*. While this item was unquestionably high in the opinion of Mr. Molitor, it was not excessively so.

Lighterage at $1,000 gold per mile, covering three years of construction work would amount to $300,000, or $100,000 *per annum*, which Mr. Molitor considered wholly unreasonable.

Storehouse Expenses, figuring for the entire work on their unit price, would mount to an expenditure of $9,000 *per annum*, which was regarded excessive. Equipment and Engineering considered to be not unreasonably estimated, although Administration and General Expenses and Contingencies, amounting to $800 gold and $400 gold per mile, respectively, were considered exceedingly excessive. On the basis of the estimate, Administration, covering four years' work, would amount to $60,000 *per annum*, or $240,000 in total. The General Expenses and Contingencies amounted to $30,000 gold *per annum*, or $120,000 for four years.

Plant, $400 gold per mile, would amount to a total expenditure of $120,000 which was considered excessive unless one or more steam vessels was purchased.

Government Supervision, estimated at $500 gold, or on a basis of four years $150,000 in total, was about double the probable cost of Government supervision. On a basis of the amount billed against the railway company up to the present, Mr. Molitor said it would run about $200 per mile.

Freight estimates were not excessive.

The interest on the expenditure for construction to the date of bond issue with the total estimated cost, was considered reasonable. Mr. Molitor submitted, however, that as greater economy in the construction is practiced, the interest account and profit would be decreased in a direct ratio. The profit, based on the completion of the entire lines, at the submitted average cost per mile, would amount to $6,236 gold per mile, or $1,870,800 total.

Mr. Molitor pointed out that the estimated costs for Cebú and Panay were so nearly alike that the above criticisms could well answer for both, and he believed that these lines could be built for less money.

Coming now to the most important question which Mr. Molitor held confronted the Govern-

ment in the consideration of the first plans of location submitted, and contemplating an expenditure of approximately $47,000 gold per mile, it was pertinent, he thought, to consider the probable earnings of these lines. Estimates of gross earnings were largely conjectural, especially in the Philippine Islands. Ordinarily, railroad men, through statistical information, were enabled to arrive quite closely to the amount of freight and passengers that any new railroad line would hope to carry. The conditions in the Philippines precluded the possibility of estimating upon this basis, and, therefore, in making estimates of gross earnings, the Supervising Railway Expert eliminated the personal equation and resorted to definite and known figures, so far as procurable. These figures represented the population tributary to the proposed railway lines, and the known earnings of the Manila & Dagupan Railway.

The earnings of the Manila & Dagupan Railway for several years were very discouraging. The records showed, however, that during the past three years of American occupation the earnings had gradually increased, and in 1905 the gross earnings reached the sum of $847,410 gold, or $6,946 per mile. The population tributary to this railroad line was 700,000. Taking the same area tributary to the railroad lines in the Visayan Group as is tapped by the Manila & Dagupan Railway, we have:—

Panay—	Populat'n,	240,000;	95 mls. of prop'd. railroads
Cebú—	"	315,000;	80 " " " "
Negros—	"	230,000;	108 " " " "

Two-thirds of the gross earnings of the Manila & Dagupan Railway are derived from passenger receipts. The country traversed by this railroad is rich and productive, and is as good, if not better than the country traversed by the proposed railway lines in Panay, Cebú and Negros, according to Mr. Molitor; so, using the Manila & Dagupan Railway figures as a basis for estimating the probable gross earnings of the Visayan lines, was, in the opinion of Mr. Molitor, not unfair. He recognized, in this connection, that the railroad lines in the Visayan Group ran through a highly-productive country, with the exception of a comparatively small percentage. Unfortunately, however, this country was not at all in a good state of cultivation. With the energies of the normal people at work upon the soil, Mr. Molitor would say without hesitancy that the Visayan railroads would earn a good revenue, sufficient to pay a fair and reasonable dividend on the stock, besides the payment of fixed charges and the setting aside from year to year of a sum adequate to keep the lines in first-class condition; but unfortunately, at this time, this was not true. The country in Panay and Negros was not in a good state of cultivation, and in Cebú there was very little land to cultivate; so that if a comparison were made with the country through which the Manila & Dagupan road runs it was to the disadvantage of the Philippine Railway Company. Comparing the earnings of the Manila & Dagupan line with the probable earnings of the Visayan roads, there was, on the one hand, the known revenue of a railroad in operation a decade through a country whose producing power has probably been brought up to a better state of cultivation than on Panay, Cebú and Negros, while on the other hand we had a country that is not in nearly so good a state of cultivation, or so densely populated, and with a railway system still in its primary stage of construction. Taking the gross earnings of the Manila & Dagupan Railway for 1905, and the population tributary thereto, as above indicated, Mr. Molitor showed its gross earnings capacity to be $1.20 gold per inhabitant, or $0.0098 *per capita* per mile. Applying this unit to the Visayan Group, the gross earnings were as follows:—

95 miles of line on Panay	$2,400 per mile
108 miles of line on Negros	2,300 " "
80 miles of line on Cebú	3,100 " "

As to the net revenue, Mr. Molitor expressed the belief that these railroads could be easily operated on from 40 to 50 per cent of the gross earnings, because the cost of operation here was much less than in the United States; provided the company was not overloaded with an expensive staff of administrative officers. The Manila & Dagupan line was operated for a little less than 40 per cent. Assuming, therefore, that the Visayan railways would be operated for 40 per cent we had 60 per cent for gross earnings applicable to taxes, betterments, and fixed charges, *i. e.*, payment of the interest on the bonds:—

Railroad on Panay	$1,200 per mile
Railroad on Cebú	1,550 " "
Railroad on Negros	1,150 " "

The fixed charges per mile *per annum* on the railroad costing $47,000 gold per mile, at an interest rate of 4 per cent, was $1,680 per mile, or a deficit of $450 per mile *per annum*, or on an estimated mileage of 283 miles $207,350 *per annum*, which the Philippine Government would be required to pay. In order for the Philippine Railway Company to meet its fixed charges on the above estimated gross earnings, the lines should not cost over $31,000 per mile. Mr. Molitor doubted, however, from knowledge gained in the past few months, that these lines could be built for such an amount except in a very cheap and poor manner. This policy would not be consistent considering local and climatic conditions, which, on account of the excessive rainfall, are very hard on roadbed, bridges and materials entering into the trackwork, telegraph line, building, etc. However, Mr. Molitor expressed the belief that the subject was of sufficient importance to warrant most careful surveys and preparations of plans for construction to the end that the cost might be kept down to the lowest point compatible with a proper standard of construction, applicable and adaptable to local conditions; and he further more thought that a great effort should be made to keep the cost within $35,000 per mile.

Mr. Molitor also took exceptions to the location of the line on Panay, between Iloilo and Pototon, suggesting that a survey also through Zarraga should have been made for comparison with the one submitted, which lies through Santa Barbara, with a view to the cheaper construction.

CANTON'S PUBLIC IMPROVEMENTS

According to the Canton (China) correspondent of the *South China Morning Post* large quantities of cast iron pipes have been received there for the new waterworks system. They vary in size from 4 to 24″, the latter being the dimension of the mains. The contract for the excavations and the laying of pipes has been awarded to a Chinaman, who is working in conjunction with Europeans. His tender was for over $300,000. The reservoir is to be located near the White Cloud Mountains, where there is an abundant supply of clear spring water of a high degree of purity. Water will be laid on to all parts of the city.

Canton is rousing herself without a doubt in the matter of public improvements. Among the squalid huts, not creditable as pig sties, among streets so narrow that two chairs can not pass, among byways dangerous to walk in, among cesspools where fish are fattened in a manner too filthy to mention, by open sewers and sewers under granite-paved roads with great gaping cracks, have been erected some exceedingly handsome dwellings. Electric light and telephones are in full swing and great improvements to the roads of the suburbs are being inaugurated.

Progress seems to pervade the atmosphere. Canton has no *lungs* and she wants them badly. It is said that in the years gone by, which in such an ancient city as Canton might date back to Noah, the streets were wider, but whenever a fire occurred the property owner, true to Chinese instinct, *squeezed* a piece of land off the road. It is no use to wait for fires now to turn the tables; whole streets must be demolished to put the streets in good shape. Such drastic measures, however, would necessarily displace a great population, and reforms can only be proceeded with slowly after every provision has been made. The buildings in Canton are very low, mostly one or at most two-story structures. Were the buildings high, fresh air would have but scant passage and the health of the people must suffer severely. Again, open drains are far safer than badly-constructed closed ones, from which leakage of air would be a constant danger, for such would cause a pestilence. The Cantonese are one and all tea-drinkers, and many would no more take water *straight* than jump over the moon. Now that they will be provided with a bountiful supply of pure fresh water, they may learn in time to think differently.

SIAM'S RAILWAY DEVELOPMENT

A recent dispatch announces that the Government of Siam is negotiating a loan in London of £3,000,000, and in commenting on the loan the *Bangkok Times* says: "One of the first cases likely to be affected by the introduction of foreign capital is railway construction, since one obvious way of getting the work done is by the foreign contractor, or company, with a Government guarantee of a certain interest. The next foreign loan, for railways and other public works, would presumably have been issued by this time if the money market had been easier in Europe, but whether it is for three or more millions the Northern Railway will in all likelihood require all of that portion ear-marked for railway construction. Of course if it were such a work of public utility as the water supply for the capital, the Peninsula Railway would have to be postponed to a distant future. If the present brackish condition of the river gives any indication, we shall hear much about that water supply before the rains arrive, but we can not say that there is any immediate prospect of anything being done. The Peninsula Railway, however, is a different matter and as the importance of time in this instance seems to be recognized there is not likely to be any excessive delay in making the beginning. Under these circumstances the question of the investment of foreign capital in the enterprise becomes one of immediate interest. Our London correspondent takes, naturally, the London viewpoint, and considers the reasons the financier has for looking askance at investments in Siam. But as regards railways, at least, Siam is equally nervous when the foreign contractor is mentioned. The contract for the Korat Railway proved a costly experience for this country, but the only lesson to be drawn is that Siam should not make the same mistake again. Before that contract was settled Mr. Bethge, the Director-General of Railways, was interviewed by the *Bangkok Times*, and openly stated that it would be impossible for Mr. Murray Campbell to carry out his contract at the price he had offered. Expert opinion generally concurred in this view, and no one doubts now that it was the correct view. Moreover, expert opinion also held that the offer of the firm of Krupp was too low. If Siam made the same mistake again she would know what to expect, but countries have often had railways built under such conditions as Siam could impose with advantage to herself in this instance. The point is worth emphasizing as there seems to be a general belief that if there is to be no delay some such method will have to be adopted. Delay can not be too strongly deprecated."

HUMPHREYS ESTATE AND FINANCE COMPANY, HONGKONG.—The net profits of this company during 1906 amounted to $140,551.69. The balance brought forward from 1905 account was $5,070.62, making a total of $145,622.31. From this is deducted 5 per cent remuneration to the directors, 5 per cent remuneration to the general managers as commission on net profits amounting to $14,055.16 in all, leaving avaliable for appropriation $131,567.15. A dividend of 8 per cent on the paid-up capital is to be paid to shareholders, absorbing $120,000. The balance of $11,567.15 is carried to the new Profit and Loss Account. The new directory consists of Messrs. A. G. Wood, J. S. Van Buren, J. Scott Harston, H. A. W. Slade, Ho Tung and J. Scott Harston, the last-named gentleman succeeding to the vacancy caused by the retirement of C. Ewens. Messrs. W. H. Gaskell and W. Hutton Potts are retained as auditors.

KOREAN SYNDICATE, LTD.—At the annual general meeting of the Korean Syndicate, Ltd., held recently at the company's offices, Salisbury House, London, Mr. H. E. M. Bourke, who presided, stated, according to *The Anglo-Japanese Gazette*, that the calls appearing in the balance-sheet as being in arrear, and amounting to £2,648, had since been reduced to £400. An amount of £2,642 had been expended upon development work. The title to the concession was granted by the Korean Government, with the approval of the Japanese authorities, on demand of the British Minister at Seoul, and gave the company very wide powers, including the construction of railways. The area of the concession was 216 square miles, and the consideration was a royalty of 1 per cent on the value of the output of the Suan Mine. Besides this, there was a yearly rental levied on the land in occupation, which only amounted in 1905 to £10. The work undertaken has proved highly satisfactory, judging from the assays given in the report.

Paper-Making from Philippine Fibers and Fibrous Substances*

Bamboo is the chief material in use in the paper-making industry of China. The Chinese employ the native bamboo, which they split into lengths of from 1 to 1.3 meters each and then place in a vat or tank with alternate layers of lime; water is then poured in to cover the stems and the whole left for three or four months. When the bamboo has become sufficiently rotted it is pounded in a mortar, mixed with water, and moulded into square sheets of paper.

A British authority (Mr. Routledge) was firm in the belief that only young shoots, collected before the plant had arrived at maturity and become hardened by a deposit of silicious matter, would be serviceable for paper-making, and it was upon this supposition that the main objections and practical difficulties to the use of bamboo for paper stock were based. It was also found at the time that the removal of young and tender stems from the growing plants was disastrous to the parent stock to such an extent that entire bamboo forests would be endangered, and that the cost of transportation of the young, succulent shoots from the jungles to the mill site would prohibit their economic use.

As the only practical attempt at the manufacture of paper from bamboo, namely, that from the elephant grass of British Burma, resulted in the report that this particular species offers great restraint to chemical treatment, it was thought advisable by Mr. Richmond to experiment with at least two different varieties of Philippine bamboo in order to determine their value as compared with other graminaceous fiber plants to which they are closely related and also with pulp woods, which, because of their dense, woody nature, they so much resemble and with which they should perhaps more properly be compared.

Philippine Bamboo.—The two most important and widely distributed Philippine bamboos are the common thick-walled variety, and the thin-walled dwarf bamboo, known as *caña-boho*. The former is almost exclusively used for building purposes, because of its strength and durability. Dwarf bamboo is the variety in general use throughout the Islands for the manufacture of wooden products used for lining or filling the walls, ceilings, floors, doors, and shutters of nipa houses. This species is never cultivated

Chemical Comparison with other Grasses.—The fibers of graminaceous plants exhibit a certain resemblance in form and appearance. Manifestly, papers made from these substances should possess very similar properties. The grass-like character of bamboo is further shown by the similarity of its chemical composition with that of other grasses. This will be understood by a study of the following table:—

Constituents.	Bambco.	Wheat straw.	Rye straw.	Structural Bamboo.	Dwarf bamboo.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per5 cent.3*
Cellulose	50.13	46.60	47.69	53.94	55.79
Fat and wax	.78	1.49	1.93	.96	1.07
Aqueous extract	10.56	8.07	9.05	4.98	4.60
Noncellulose or lignin	24.84	28.49	26.75	24.25	21.26
Water	8.56	9.85	11.38	12.40	11.26
Ash	5.13	5.50	3.20	3.47	6.03

Preparation of Paper Cellulose from Bamboo.—The procedures employed for obtaining paper cellulose from esparto and the cereal straws are applicable to bamboo as well. Because of the great solvent action of alkaline solutions, comparatively little pains are necessary in the preparation of bamboo for the digestion process. First, there is no no bark to be removed, as in the case of the dicotyledonous pulp woods; fresh, mature stems need simply to be chipped, or better, cut in suitable lengths and crushed by passing between heavy, fluted rollers.

The quantity of alkali required to produce a well-boiled pulp from mature stems of the above-mentioned species of bamboo has been found to be 15 to 20 per cent caustic soda, calculated upon the gross weight of the material digested, which concentration yields from 40 to 50 per cent of a light-brown fiber, which has a clean and soft appearance suitable for wrappings, news, and book paper.

This consumption of alkali is not greater than is frequently necessary in practice for cooking esparto grass, and other graminaceous plants, such as the cereal straws, which are so largely employed in Europe for fine paper stock. These require from 10 to 15 per cent of caustic soda to yield 33 to 37 per cent of pure fiber.

On the other hand, the commercial pulp woods used in the production of soda fiber demand a much greater proportion of alkali for their complete resolution. The amount of caustic soda employed in practice, in making soda wood pulp can only be approximated. It is customary to add sufficient liquor of a known strength to cover the chips, and this volume depends, of course, upon the state of division of the wood, the thoroughness with which it is packed or tamped down, and the form of boiler employed. Griffin and Little give 700 gallons of liquor per cord of wood when rotary boilers are used, and a much larger volume in case stationary, upright digesters are employed. One thousand gallons of liquor, carrying 7½ per cent caustic soda (the average strength employed), would contain about 284 kilos (625 lbs.) per one cord of chips, but the weight of a cord of pulp-wood chips is very indefinite. Its approximate weight may be deduced indirectly, by knowing the amount of pulp a cord of wood will yield and the average percentage yield of pulp from a given wood by the soda process.

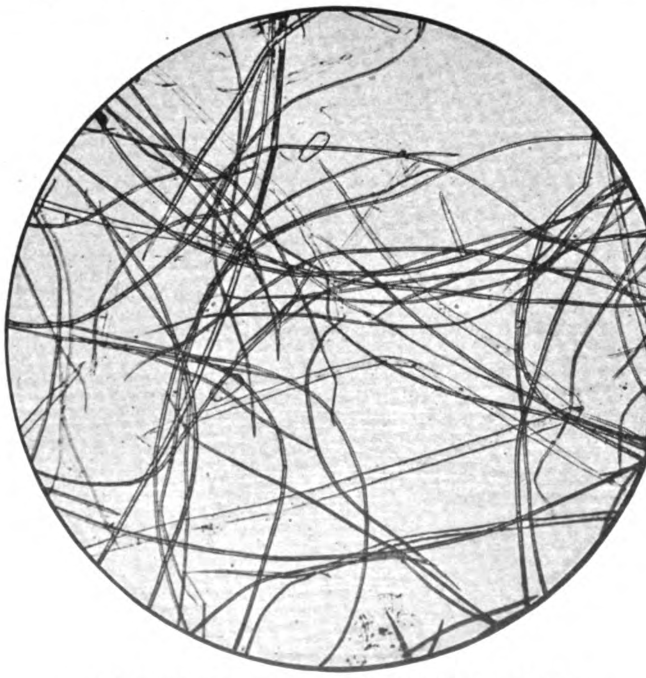
454.5 kilos (1,000 pounds) of pulp is considered an average yield from one cord of poplar wood. The average percentage of yield pulp of wood by the soda method of treatment may be given as 40 per cent. Thus 454.5 kilos of pulp represent 1,136.3 kilos (2,500 pounds) of wood, and one cord of wood (1,136.3 kilos) consumes 284 kilos of caustic soda, or 25 per cent, calculated on the gross weight of the wood.

The above calculation demonstrates that mature bamboo is much more easily resolved into paper fiber than is the most generally used wood employed for the manufacture of paper pulp by the soda process.

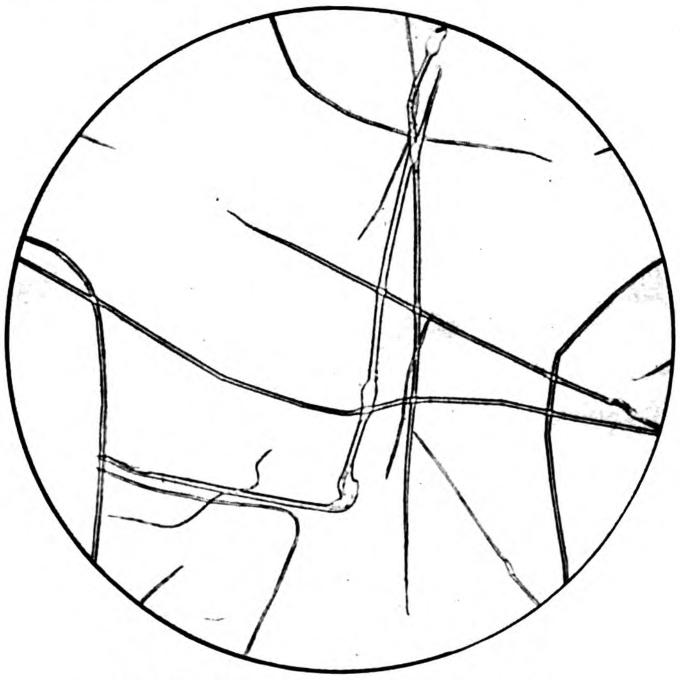
Preliminary Preparation of Bamboo for Digestion Experiments.—At first the outer, silicated rind and the nodes or joints of mature culms were digested separately, but it was found that the latter yielded to alkaline treatment with the formation of very little shive, but with a less cellulose content than when internodes alone were used. The yield of pulp on the nodes and rind, respectively, was 35 per cent, as compared with one of 42 per cent on internode wood alone, under the same conditions. This deficiency is fully accounted for by the larger amount of mineral matter deposited in the joints and on the exterior surfaces of the mature bamboo stems.

All experiments in this direction showed that in practice the joints or nodes, if well crushed, would offer no resistance to caustic soda liquors and that it would not be necessary or even advantageous to effect any preliminary sorting between the different portions of the stem hence in the recorded experiments no separation was practiced. Bamboo pulp, similarly to straw and grass fibers, shows a tendency to roll up into little balls under slow motion so that rotary digesters would probably prove unsuited to this raw material.

Experimental Part.—All of the digestion and bleaching experiments tabulated below were made on 454 gram lots (1 lb.) of air-dried material. The bamboo chips or sticks were packed into an upright digester, variable quantities of caustic soda liquor, in all cases sufficient to cover the chips, were added, and the heating was done by direct flame.

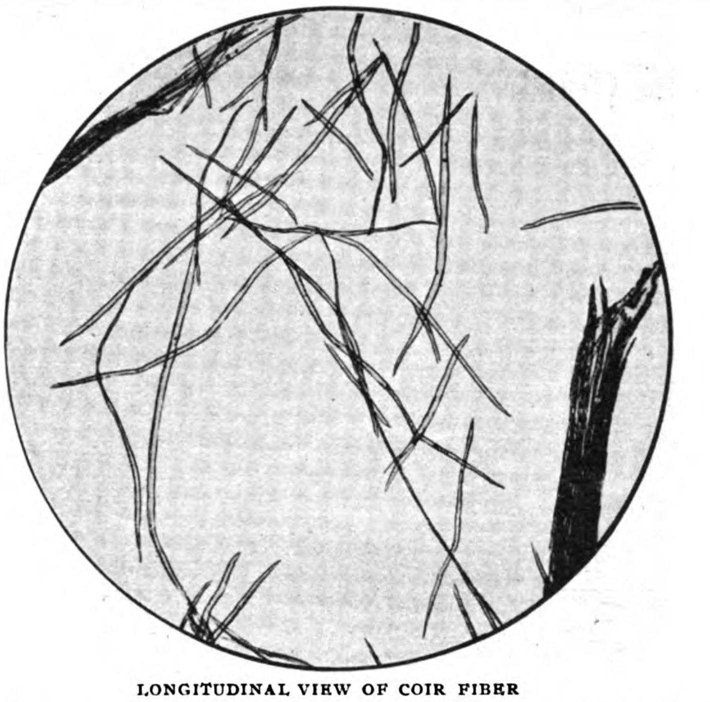


LONGITUDINAL VIEW OF STRUCTURAL BAMBOO

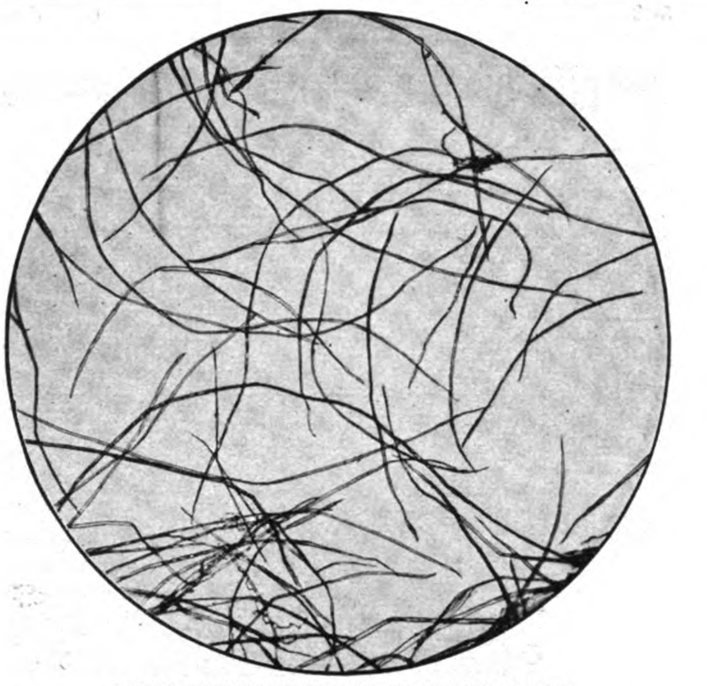


LONGITUDINAL VIEW OF DWARF BAMBOO

*Condensed from a paper by *George F. Richmond*, Government Chemist.



LONGITUDINAL VIEW OF COIR FIBER



LONGITUDINAL VIEW OF BURI-PALM FIBER

DWARF BAMBOO (*Bambusa lumanpao*).

Conditions of digestion.	Experiments. I.	II.	III.	IV.	V.	VI.
Strength of liquor........per cent....	10	10	7½	7½	3⅓	6⅓
Amount of caustic soda calculated on the weight of the material digested........per cent....	22½	20	17½	15	22½	12½
Time of boiling........hours....	5	5	10	5	5	10
Pressures employed....atmospheres....	8	5-6	6-7	6-7	5-6	6-7
Yield of pulp:						
Unbleached........per cent....	44.05	45.6	47.22	49.1	46.33	50.4
Bleached........do....	41.4	42.6	....	43.7	....	....
Amount of bleaching powder consumed........per cent....	9.9	13.3	....	16.1	....	....
Loss of weight in bleaching...do....	6.1	6.8	....	12	....	....
Color........	Cream	Light cream	....	Good white.	....	....

STRUCTURAL BAMBOO (*Bambusa Blumeana*).

Conditions of digestion.	Experiments. I.	II.	III.	IV.	V.	VI.
Strength of liquor........per cent....	10	10	7½	7½	3⅓	6⅓
Amount of caustic soda calculated on the weight of the material digested, per cent........	22½	20	17½	15	20	12½
Time of boiling........hours....	9	5	5	5	5	5
Pressures employed....atmospheres....	6	5-6	8	6-7	8	6-7
Yield of pulp:						
Unbleached........per cent....	41.75	42	42.55	41	42.7	43.1
Bleached........per cent....	....	40.2	40.6	....	39.4	....
Amount of bleaching powder consumed........per cent....	22 85	21.7	23.9	....	24.8	....
Loss of weight in bleaching, per cent....	....	4 4	4 6	....	7.9	....
Color........	Yellow	Cream	....	....	Poor white.	....

The experiments outlined above bring out the following considerations.—

First. Dwarf bamboo is superior to the structural variety both in yield of unbleached pulp and in consumption of bleaching agent.

Second. Caustic soda, in the proportion of 10 to 20 per cent, calculated on the gross weight of the canes, is sufficient to produce a well-digested pulp.

Third. The duration of the digestions and the pressures and corresponding temperatures carried are considerably less than are employed in pulping the common, soft woods by this process, and compare very favorably with those used in practice for straw cellulose manufacture.

Fourth. The structural bamboo requires excessive quantities of bleach (20 to 25 per cent) to produce at best a poor white, while the dwarf variety, on the other hand, is bleached a good white with the equivalent amount of powder consumed by annual and perennial straws, namely, 10 to 20 per cent.

Palm Fibers.—Several species of the other *Palmeæ*, including rattans, betel-nut palm, nipa palm, buri palm, and coconut palm, are found widely distributed throughout the Archipelago and contribute to the local demands of the people for food and fiber.

The *bejucos* or rattans, which occur so plentifully throughout forested regions, are used principally for the manufacture of furniture, and they are far too valuable to be otherwise primarily employed. The various pieces of furniture into which rattans so largely enter are constructed entirely of this material and dwarf bamboo, so that old or worn-out articles of this class could be utilized at a paper mill without any preliminary cleaning or sorting.

Betel-nut palm is found both in the wild and cultivated state.

Nipa palm is a well-known and valuable plant which for the most part is cultivated. As this plant is found only within the influence of salt water, near the seashore, and as considerable commerce in the leaves of this plant for thatching purposes is already established, the long leafstalks, which contain a strong structural fiber but which are at present discarded as worthless, are available in large quantities.

Coconut palm.—The commercial fiber of this plant, known as *coir*, is found in the husk or fibrous pericarp surrounding the nut. There is no established commerce in *coir* or coconut fiber in the Philippines, but there is a large and growing industry in copra, and coconut oil production is steadily increasing. Practically all the husks encountered in the coconut districts are dry, brown, and unfit for *coir* cordage, so that at the present time they are only used for fuel or thrown away. That the amount of coconut husks annually consumed is considerable is evidenced from the statistics on copra exportations. In 1905 approximately 60,000 tons of copra were exported. This represents over 400,000 tons of nuts, which in turn represents an approximately equivalent weight. These data do not include the vast quantity of nuts husked for local consumption, nor the nuts and oil exported as such.

As copra and oil will probably always be the products of first value in this industry, the husk produced and now almost exclusively used for fuel will be of a very inferior grade and their usefulness for purposes other than fuel will, on this account, be limited. However, coconut husks contain considerable fiber, and as they are now a rather worthless by-product of a large and rapidly growing industry, and as this fact assures their availability in almost unlimited quantities, they are worth considering from the standpoint of their applicability for paper or pulp manufacture.

Lengthy experimentation with coconut husks has shown that the fibers can not economically be separated from the cellular matter in which they are embedded, at least not by caustic alkalies. A treatment sufficiently drastic to remove this nonfibrous matter not only causes too great an expense in the chemicals involved but seriously attacks the fibers themselves; furthermore, this class of fiber is not amenable to bleaching processes.

For the production of pulp for purposes other than paper this material appears both cheap and admirable. As a substitute for wood pulp in the manufacture of various commodities such as roofing and felting materials, in which case a complete removal of the corky layers is not necessary or advisable and where bleaching is not required, the husks could be prepared by mechanical means alone or by mechanical means followed by a mild alkaline treatment. In the dry state in which the husks come to the consumer they are easily roughly cleaned to form a tow-like mass of fibers, which greatly resembles oakum, and which represents from 40 to 60 per cent of the gross weight of the husk, depending upon the quantity of corky matter still adhering to it.

In those countries where coir fiber is an article of commerce, the husks are first crushed between heavy, fluted rollers, then passed through the extractor, which consists essentially of a cylinder covered with steel teeth which tear the fiber from the husk, and then a subsequent winnowing removes the short fiber and dirt.

Buri palm is second only to the coconut palm in the variety and usefulness of its products. The tree is never cultivated, but it grows luxuriantly in a wild state in many sections of the Islands. The Recoleto estate in Southwestern Mindoro contains hundreds of thousands of individuals of this species. One of the principal uses of this palm is to furnish material from which mats and sugar sacks are made. The leaf is the only part suitable for these purposes. The long leafstalk, which contains abundant structural fiber, is employed for making fine hats and coarse ropes and twine. Throughout Panay, where this palm is widely distributed, it furnishes practically all the cordage fiber in use. Good-loking rope is made by beating

(Continued on page 302.)

INDUSTRIES OF THE BRITISH NORTH BORNEO TRADING COMPANY

The North Borneo Trading Company, Ltd., is a substantial and enterprising general engineering, shipbuilding, planting and timber exporting concern of British North Borneo. Its operating headquarters are at Sandakan, where a fine, well-sheltered harbor permits of the loading of sea-going vessels without interruption. Besides its own enterprise, the company has the sole agency in Borneo and the Philippine Islands for Messrs. McKie & Baxter, Copland Works, Govan, Glasgow, engineers and shipbuilders, and is contractor to the British Admiralty, the War Office, several foreign governments, and the principal buyers of Great Britain and other countries. Communication is kept up between Sandakan and Singapore by steamers leaving regularly every 14 days from both ports. One of these steamers goes on to Zamboanga, Moro Province, P. I.; another vessel leaves Singapore for Medano *via* Borneo ports and Zamboanga, and still another touches at Southeastern Borneo ports. Messrs. Behn, Meyer & Co., Ltd., have carefully prepared timetables for these three vessels, and intending visitors can plan their voyage with ease because of the certainty of close connection. Messrs. Melchers & Co. and Messrs. Jardine, Matheson & Co., of Hongkong, will furnish information of sailing dates for the steamers *Borneo* and *Mausang*, which vessels maintain a regular trade with that port and Sandakan.

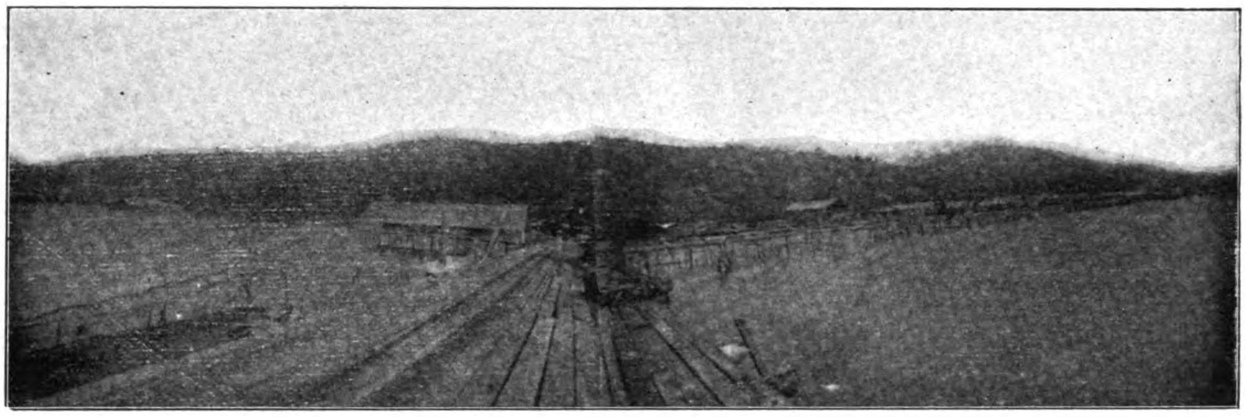
Shipbuilding Yard.—The company's shipbuilding yard is capable of turning out any kind of wooden vessel up to 500 tons, and it has constructed for local and foreign buyers steam launches, schooners (both sail and steam, small and large), lighters and lorchas. The company's resources enable it to select the best material for construction of hulls, and as all machinery is imported direct from Great Britain, buyers can rely on obtaining the greatest efficiency at moderate cost. The workshop is capable of dealing with engineering work of all kinds and a large stock of engineers' stores are kept in hand. The whole is under the supervision of a certified engineer. Prompt attention is given to inquiries for marine machinery, boilers of all kinds, steel vessels, fast launches, stern and sidewheel steamers of light draft, and composite yachts, etc., "Challenge" centrifugal pumps and engines for dock work, salvage purposes and use on board ships, and compound and triple engines for mills, factories and other manufacturing industries. The company's works are located about three miles inside Sandakan Bay and vessels drawing 18′ can moor alongside the wharf.

Planting and Timber Holdings.—The company owns over 103,000 acres of freehold (999 years) land around Sandakan Bay. The land is well selected, situated on navigable rivers and suitable for the cultivation of rubber, tobacco, coffee, sugar, hemp, coconuts and all other tropical products. The company has cultivated all of the above mentioned products and is at present putting para rubber on the market from its estate at Sikong. It is the successful pioneer of the rubber industry in British North Borneo and has now to meet the demands for seeds and stumps of other companies that have profited by its experience and are now operating along the same lines. The company is prepared to lease a part of its land on advantageous terms to planters who are unwilling to invest capital in land until they can do so from the returns on their crops.

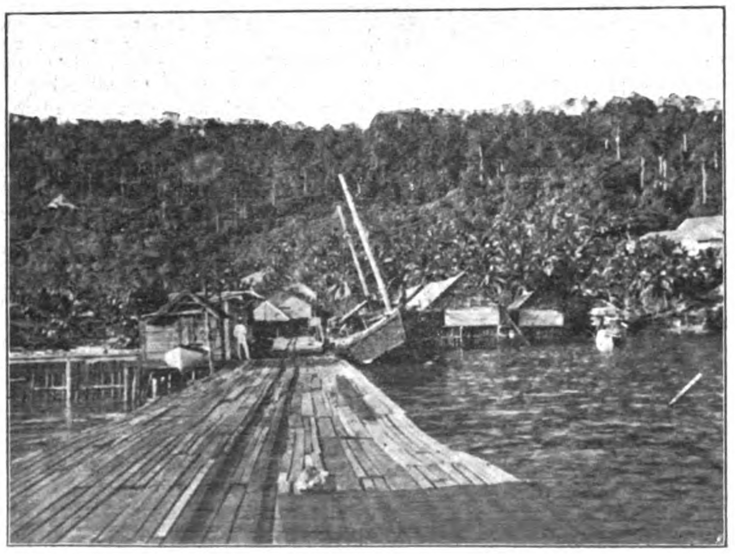
In addition to freehold property the company has hundreds of square miles of leased forest lands over which it holds timber-cutting rights. Its steam sawmills are located at Sandakan, one mile from the town, with frontage on the harbor. Rough supplies are brought in by lighters and rafts from the rivers in and outside the bay territory, and shipments are made from Sandakan and the company's workings in Cowie Harbor, which is 270 miles from Sandakan. The sawmills are capable of handling all classes of timber in lengths up to 60′, and large stocks of standard building sizes in a variety of woods are kept on hand. Railway sleepers are cut to order in any dimension, while first-class hardwood piling and logs, either in the round or rough hewn squares, can be supplied at short notice. The company's timbers are well-known in a great many markets and prospective buyers may obtain results of tests and dealers' opinions from the company's Sandakan office or its duly authorized agents in China and elsewhere. The company exports to England, Europe, India, China and Singapore, piles, poles, round and rough hewn squares and timber sawn to any specification. Railroad ties figure largely in the company's business and it is rapidly extending operations to meet the increasing demand. The following descriptions of Borneo timbers will be useful to buyers as a guide to the selection of suitable materials for their requirements. Maximum girth or size of square is not given with extreme lengths; the sizes specified are for lengths up to 30′ and they can be materially increased for lengths of about 20′.

Description of Borneo Woods.—*Billian or Borneo Ironwood* (**sp. gr.* 80).—A first-class heavy hardwood of solid texture. When recently cut the color is a pale-yellow which rapidly darkens with exposure until it becomes almost black. It is principally used for piling and marine work as it offers great resistance

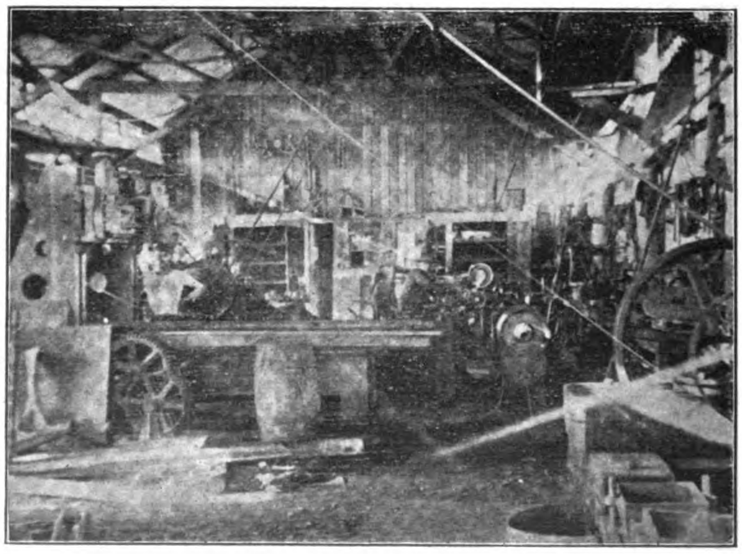
* Specific gravity in pounds per cubic foot of fairly-seasoned timber.



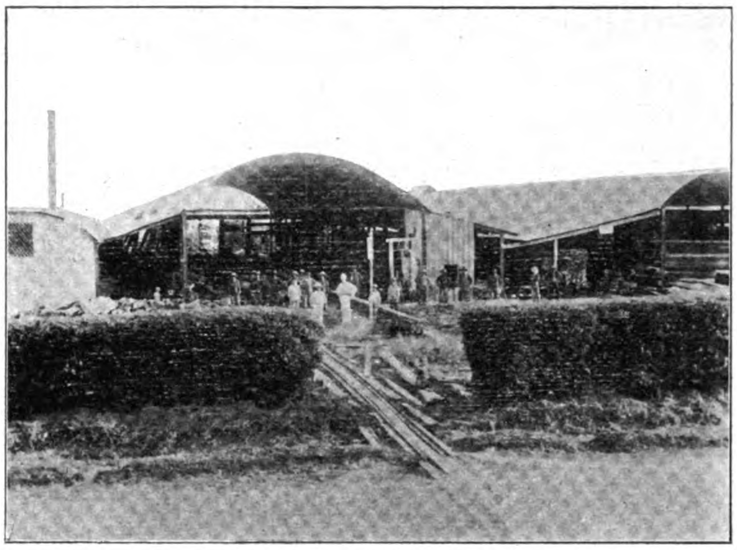
ROUGH TOP ENCLOSURE BETWEEN THE NORTH BORNEO TRADING COMPANY'S TWO WHARVES; MILL AND OLD WORKSHOP, SAWMILLS, SHIPBUILDING SHEDS, OFFICES, ETC., IN THE BACKGROUND



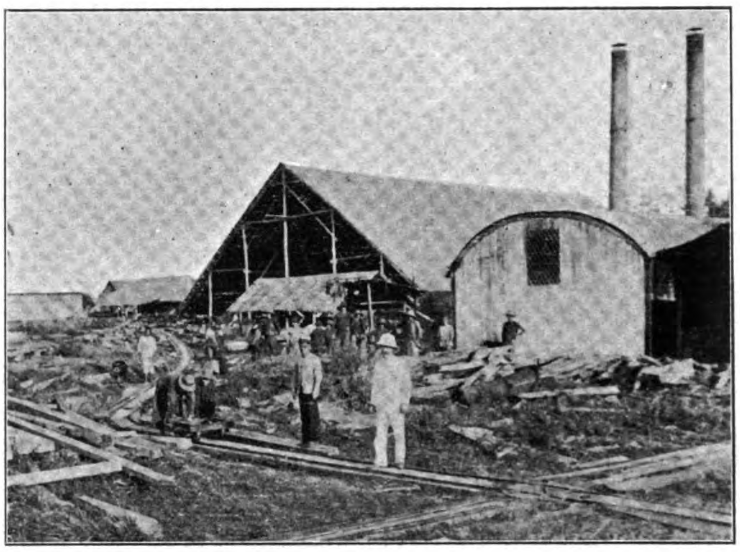
WHARF OF THE ENGINEERING SHOP



NORTH END OF ENGINEERING SHOP



SAWMILLS AND SHEDS WHERE NATIVE HARDWOOD PRODUCTS ARE STORED FOR EXPORT

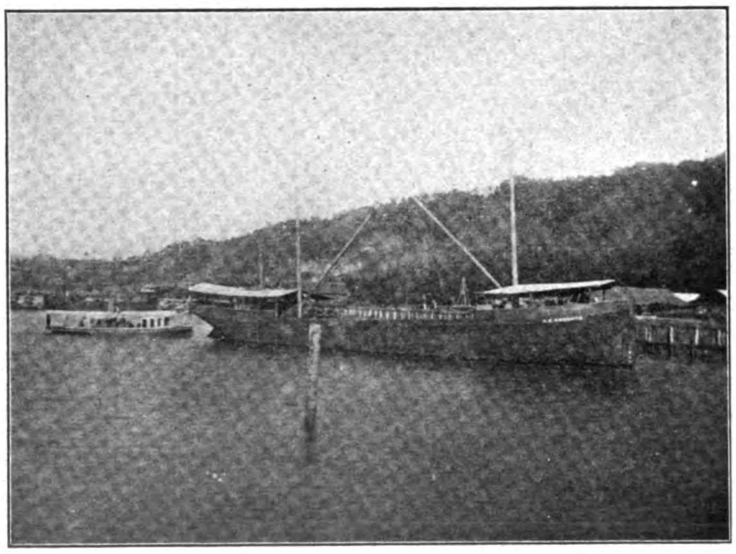


BOILER-HOUSE OF THE MILLS; SHIPBUILDING SHEDS AND CORNER OF WORKSHOP IN THE DISTANCE

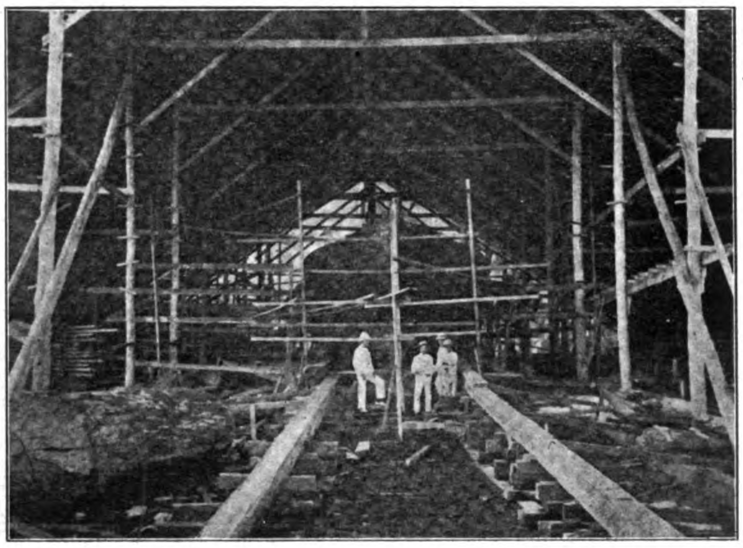
to the teredo. It is almost impervious to decay and can be used for posts and pillars with earth foundations. It is obtainable in round logs up to 40′ long and 18″ diameter and in rough hewn logs up to 30 to 18″ square. *Selangan batu* (*sp. gr.* 62)—A hard wood of the highest grade; solid and fine texture, breaking in long splinters, and capable of bearing great transverse stress. Its length and durability admirably adapt it for wharf decking, sleepers or railway ties, bridge work, beams, joints, framing and any work necessitating the employment of the best material. It is largely used in naval construction for keels, etc. Color ranges from yellow-brown to dark-red. It is obtainable in round logs up to 50′ and 24″ diameter and rough hewn logs up to 30′ and 24″ square. *Griting* (*sp. gr.* 54)—This is a timber of the Superior Group. Its pores are scarcely perceptible and the texture is compact, fine and particularly smooth. Color light-red, has an excellent reputation for resistance to the sea worm and is largely used for wharf piles and all work exposed to the action of the weather. It is very suitable for wagon-building, framing and general construction. It is obtainable in round logs and piles up to 45′ and 18″ diameter and rough hewn logs up to 30′ long and 12″ square. *Camphor* (*sp. gr.* 46)—This is a hardwood of compact texture, fibrous and smooth; color varies from very light-to dark-red. It is greatly in demand for house-building, both interior and exterior work, furniture-making, railway ties, carriage and wagon works; naval construction for outside planking and lining It is tenacious, resisting well all transverse pressures, and is a thoroughly reliable and generally useful timber. Round logs up to 40′ long and 30″ diameter; rough hewn logs up to 35′ long and 24″ square. *Kruen* (*sp. gr.* 50)—Similar to foregoing and obtainable in same dimensions but is more uniform in color, being a good dark-red and not quite so compact in texture.

(Continued on page 304.)

TAPPING PARA RUBBER TREES, AND A STAND OF YOUNG TREES, COMPANY'S SIKONG ESTATE



LARGE STEEL SCHOONER BUILT BY THE COMPANY



PREPARING TO LAUNCH A BIG LIGHTER

PAPER-MAKING FROM PHILIPPINE FIBERS AND FIBROUS SUBSTANCES

(Concluded from page 299.)

the fresh, green leafstalks until the fibers are partially separated, and then, after drying, these are twisted into cordage of various sizes.

Only *coconut husks*, which were taken to represent the class of fiber to be obtained from any palm fruit-pericarp, and *buri palm* rope fiber, which was considered to typify the class to be obtained from the leafstalks palms, were studied.

EXPERIMENT PART—COCONUT FIBER.—*Experiment I.*—The fibrous tow, prepared by shredding dry husks by hand, was digested for three hours at 4 to 6 atmospheres pressure with an excess of 2 per cent caustic soda solution. A yield of 47.76 per cent was obtained. *Experiment II.*—Uncleaned husks, cut up into fine pieces and treated as outlined in Experiment I, gave a yield of 26 per cent. *Experiment III.*—Fibrous tow prepared as in Experiment I, digested during seven hours at 6 atmospheres pressure with line and soda ash in quantities sufficient to form 20 per cent caustic soda calculated on the weight of the material treated, produced a 49 per cent yield of well-pulped fiber containing some undissolved foreign matter. BURI PALM ROPE—*Experiment I.*—Old worn rope was cut up into small pieces and digested for six hours at 4 to 5 atmospheres pressure with a 2 per cent caustic soda solution. A yield of 30.1 per cent was obtained. *Experiment II.*—New 1-inch rope of this fiber, purchased in the open market and subjected to the same conditions as in Experiment I, gave a yield of 37.3 per cent.

Palm fibers, as has been stated, do not bleach readily, hence no quantitative bleach experiments were conducted with these pulps. Hand-made sheets of unbleached paper made from palm fibers were found to be strong and fairly free from shive.

The local profusion of this family of plants and the vast quantities of available waste material resulting from the well-established copra, sugar sack, and nipa thatch industries makes it worthy of attention.

"THE LOS ANGELES TIMES" WINTER NUMBER

THE REVIEW has received a copy of the special Midwinter Number of *The Los Angeles (Cal.) Times*, which proves to be one of the largest and most interesting illustrated exponents of the climatic, industrial and commercial advantages of the thriving city of Los Angeles and of Southern California and other Pacific slope territory, that has ever been attempted. Among the many contributed articles which should command general attention are the following by Mr. Walter J. Ballard, the versatile American statistical and commercial writer, whose contributions appear in many of the leading newspapers of the United States:—"Electric Power in Los Angeles," "Petroleum Furnishes Cheap Fuel for Factories," "Mild Climate and Freedom from Strikes Encourage Factories," "Canning Fruits and Vegetables in Southern California," "Banking in California Has Been a Great Success," "California's Public Debt," "Remarkable Progress," "What We Live On," "Remarkable Growth," "California's Wine Industry," "Romantic and Eventful History of Arizona," "Smelting and Refining Copper in Arizona," "Churches of Arizona," "Foreign Commerce of Arizona," and "Annexation Profitable to Porto Rico." General Harrison Otis, who conducted the California party to Manila *via* oriental ports, last summer, is editor of *The Times*.

NOTEWORTHY SHIPPING INCIDENT

According to London authority, the most noteworthy incident in the shipping record of the Far East for 1906 was the transport of the Russian prisoners from Japan to Vladivostok, and the troops from Vladivostok to Odessa. Up to the time when the specially-appointed commission announced that the process was complete so far as sea transport was concerned, about 45 steamers had been chartered. Of this number 27 were British, eight German, and the balance Russian. The British steamers, such as were not fixed on time charter, obtained prices varying from £9 10s. per head, when the charterers supplied the food, to 123 roubles when the owners supplied the food. The official figures show that about 1,000,000 souls were dealt with after the war, as follows:—500,000 returned by the Transsiberian Railway, 140,000 returned by sea, 60,000 Siberians walked home, 60,000 remained as colonists, 100,000 remained as railway guards, and 150,000 remained as the Manchurian Army depot. Apart from the above, nothing of interest occurred, but the small German and Scandinavian steamers were flocking home all the year, driven out from their happy hunting grounds, the seas of China and Japan, by the cheap Japanese steamers.

N. Y. K. STEAMER "HITACHI-MARU"

The fine new Nippon Yusen Kaisha steamer *Hitachi-maru*, built and engined by the Mitsu Bishi Dockyard and Engine Works, Nagasaki, is now on her maiden voyage, having recently sailed from Yokohama with a cargo of 580 tons for Antwerp. She is commanded by Captain Townsend.

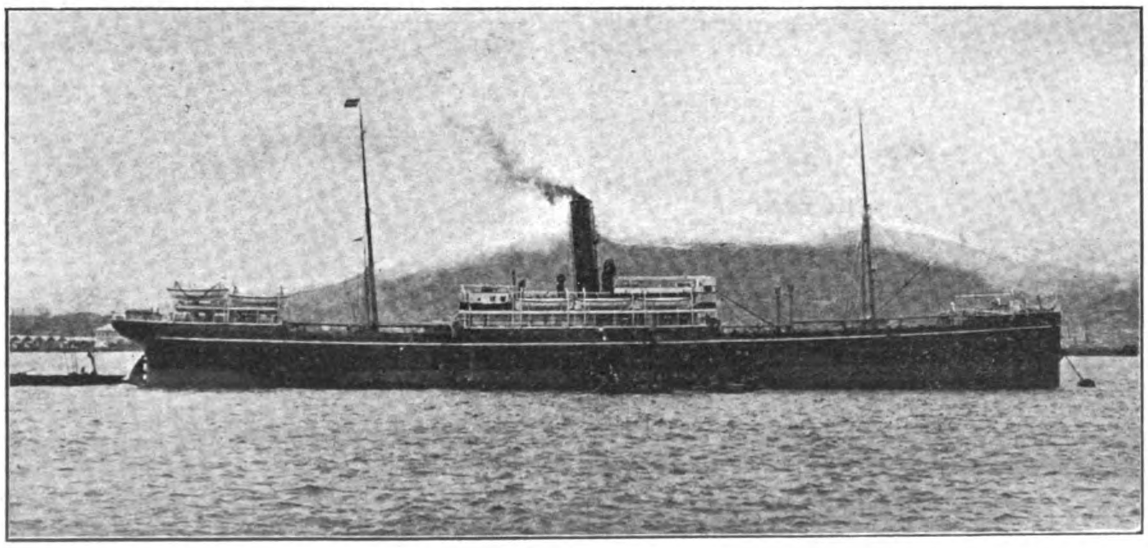
The *Hitachi-maru* is a duplicate of the ill-fated *Hitachi-maru*, sunk in the late Russo-Japanese War and is considered by experts who have inspected her one of the best all-round marine constructions that has ever been turned out by a Japanese shipbuilding company. Her keel was laid January 18th, 1906, she was launched September 22d, and was completed and delivered to the owners December 12th, 1906. Her length (B. P.) is 445′, breadth (moulded) 52′ (3′ more than ships of a similar class in the Nippon Yusen Kaisha Fleet), and depth (moulded) 33′ 6″. She has a gross tonnage of 6,715 and a net tonnage of 4,163, and her triple expansion twin-screw engines of 5,519 i. h. p. give her a speed of 15.67 knots with a coal consumption on the official trials of 1.4 lbs. per horse-power. Her hull and machinery were built to the Teishinsho Regulations and under Lloyds Special Survey and is classed 100 A1, M. C. She affords accommodation for 34 1st-class passengers, 24 2d-class, 12 intermediate, and 174 3d-class passengers. Her accommodations are complete and magnificent in every detail, corresponding most satisfactorily with the passenger classes. She is a model and modern ship throughout.

AUSTRALIAN COAL TRUST

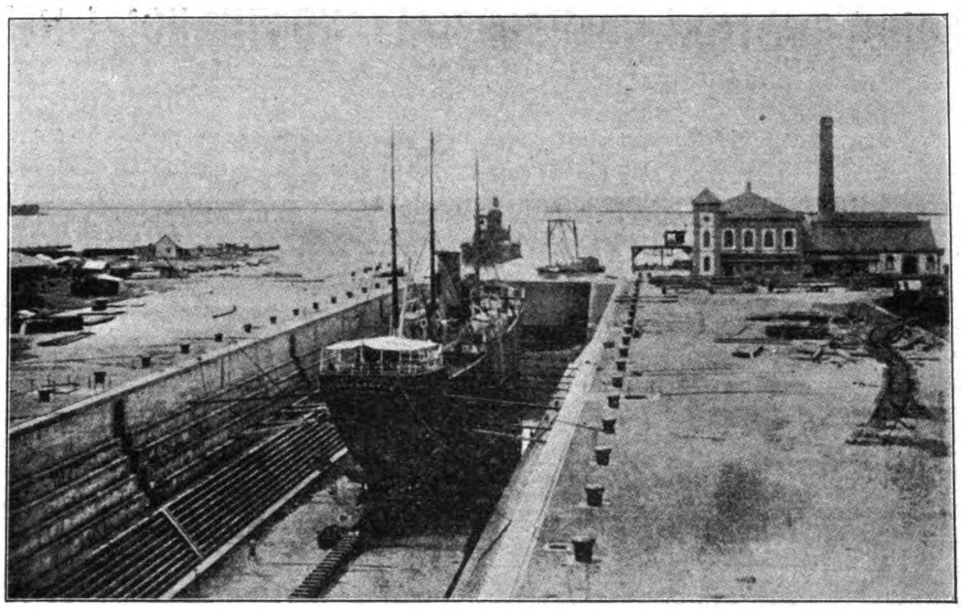
The largest commercial scheme ever formed in Australia, according to Mr. F. W. Goding, American Consul, has recently been completed in New South Wales, which included all but one of the coal-mining companies in the Newcastle District and the shipping companies controlling the sea carriage of interstate commodities. There are 31 collieries and six steamship companies represented in the combine. The *vend* will control the coal mines, will regulate the sale of coal, and, with the exception mentioned, the entire trade operations of the northern district will be directed and controlled. It will also regulate the output of each mine, and will be in a position to generally improve trade conditions, but those interested say that its object is more to prevent unnecessary competition among themselves than to raise the price of coal above a reasonable figure. For the foreign trade many factors have been taken into consideration, the arrangement being much more elastic than that for the interstate trade.

The output is governed by an agreement by which each mine is allowed to mine coal equal to the average annual output for the past three years. If a colliery sells more coal than the amount allotted by the *vend*, such colliery must pay into a fund 98 cents for each ton so sold. The money in this fund will be used to compensate owners whose output does not reach the full percentage allotted to them, at the rate of 98 cents per ton for each ton below their allotment, but the penalty imposed and the compensation made will vary with the grade of the coal, there being three grades. After January 1st, 1907, the minimum price of the highest grade will be $2.43 gold; of the second grade, $2.25; of the third grade, $1.70 per ton. There is a committee of management in Newcastle and a board in London. Through the latter all contracts for coal destined beyond Australia are arranged.

The formation of this *vend* is welcomed by owners, miners, and the public alike. For many years there has been disastrous competi-



NIPPON YUSEN KAISHA'S NEW STEAMER, "HITACHI-MARU," "BUILT BY THE MITSU BISHI DOCKYARD AND ENGINE WORKS, NAGASAKI



Reproduced from *The Empress*, Calcutta.

NEW GRAVING DOCK AT COLOMBO, SHOWING THE FIRST SHIP IN

tion among the colliery owners of this district, many of the mining troubles that have occurred undoubtedly being traced to that cause, hence the unanimity of the feeling regarding it. To the Newcastle District, and to the State, the increase in price will mean a great deal, for every 25 cents gold of a rise in value, per ton, will represent about $1,250,000 per year added to the total amount received for its coal. To what extent the formation of the *vend* alluded to conflicts with the Federal Anti-trust Act remains to be seen. However, the Federal prime minister has stated on the floor of Parliament that, as formed, the *vend* will not be affected by the enforcement of the Act, while the best legal talent is of opinion that the *vend* has nothing to fear therefrom.

GRAVING DOCK AT COLOMBO

The new graving dock at Colombo was recently opened. It represents an outlay of about $2,000,000 and is the largest of its kind in eastern seas. The dock lies nearly due east and west, a jetty 130′ long running out parallel to center line on the south side of the entrance, and a guide pier 700′ long on the north side of the entrance. The length over all of the dock, *i. e.*, from cope line of entrance to cope line at the head of the dock, was originally 663′, but another 100′ extension was authorized by the British Government, making the length over all 763′ and the length over floor 700′, the width between main copings 113′ and the width of floor 63′. The depth of floor below low water at ordinary spring tides at head of the dock is 33′, and at stern 34′, the narrowest width between copings of the entrance being 85′, and depth of the invert of entrance below low water of ordinary spring tides 30′.

In the pumping station which lies to the northwest of the dock are two main pumps capable of emptying the dock in four hours. Each is of the single inlet centrifugal type revolving horizontally, having the vertical spindle driven direct by a horizontal compound steam engine. There are also two sets of single-acting lift pumps for leadage purposes, each driven by a vertical compound engine, also a compound steam-pumping engine and accumulator for maintaining the hydraulic pressure of 700 lbs. per square inch, which is available for working the penstocks and capstans. The commodious engineroom and the Titanic 500 h. p. engines and lesser apparatus form one of the most interesting sights at the dock.

The steamer *Monkseaton*, 325.6′ in length, 37.7′ in breadth and 26.4 deep, with a draught of 17′, was the first ship to enter the dock. When the ship entered the dock the caisson was placed in position and water immediately pumped in to sink it. This did not occupy much time, and presently the dock was closed. The dock then held 70,000 tons of water less the displacement of the vessel, about 2,772 tons, and the pumping gear commenced the task of emptying out this enormous quantity. The contract time for this work was four hours. The work is, however, done in 3½ hours and with a ship in it may be done in even less time. The docking of the *Monkseaton* was most satisfactory in every respect.

INDUSTRIES OF BRITISH NORTH BORNEO TRADING COMPANY

(Concluded from page 301.)

Rungas (*sp. gr.* 48)—A hardwood of firm texture; color dark-red, with black figure, makes up into very handsome furniture, panelling, counters, and all descriptions of cabinet work. Round logs up to 30′ long and 15″ diameter; rough hewn logs up to 20′ long and 12″ square. *Seraiah Mira* (*sp. gr.* 35)—A soft-grade wood very similar to cedar. Color ranges from very light-to dark-red. It is largely used in house-building, furniture-making and boxes of all descriptions. Its color, weight, freedom from odor, and easy working qualities are particularly suitable for cigar-boxes and tea-chests. Round logs up to 40′ long and 30″ diameter; hewn logs up to 25′ long and 24″ square. *Merabau* (*sp. gr.* 60)—A first-class hardwood of great toughness and durability. Its color ranges from a reddish-yellow to a reddish-brown. It has a fine texture, polishes well and makes a handsome appearance. It is used for a variety of purposes, such as cabinet- and furniture-making, panelling, railway carriages, deck houses, etc. Dimensions obtainable in round logs up to 35′ and 40″ diameter rough hewn logs up to 25′ long and 36″ square. *Seraiah Putch* (*sp. gr.* 35)—Similar to red variety in every respect excepting color, which is white. It is used for the same purposes and is obtainable in the same dimensions. *Gagil* (*sp. gr.* 43)—A hardwood possessing the same good qualities of Camphor. Texture is firm and smooth. Color a reddish-brown darkening with exposure. Obtained in equally large dimensions. *Obar Suluk* (*sp. gr.* 43)—A medium, grade and very fine wood of a dark-red color. It is extensively used in house-building, furniture-making, railway and naval construction and joinery. Its elasticity and durability recommend it for general purposes. Round logs up to 40′ long and 40″ diameter; rough hewn logs up 30′ long and 36″ square. *Barat* (*sp. gr.* 56)—A first-class hardwood. Color reddish-brown, compact texture with hardly perceptible pores. Stands exposure well and is in demand for piles, telegraph poles, posts, pillars, etc. Obtainable in lengths up to 35′ and 15″ diameter. *Bakau* (*sp. gr.* 56)—A hardwood in great demand for foundations and piling in reclamation work. Obtainable in lengths up to 40′ and diameter of 12″. *Selangan Kacha* (*sp. gr.* 45)—Slightly superior to Gagil.

PHILIPPINE HEMP MARKET, JANUARY, 1907

(*Courtesy of* C. N. Nicholson, *Secretary Manila Chamber of Commerce.*)

Arrivals of hemp at Manila		43,277 *Bales.*
Arrivals of hemp at Cebú		12,488 "
Arrivals of hemp at all parts		55,765 *Bales.*
Stock on hand at Manila and Cebú, January 1st		63,432 *Bales.*
Total		119,197 *Bales.*
Exports to all parts	69,175 *Bales.*	
Local consumption estimated at	400 "	69,575 *Bales.*
Total stocks at Manila and Cebú on January 1st		49,622 *Bales.*

EXPORTS

Date	Vessel	London	L'pool.	Atlantic U. S. A.	PACIFIC EAST California	Australia	Other pts.	Total Bales
Jan. 2	Tean	200						209
4	Loongsang						151	151
5	Rubi	900					500	1,400
" 7	Lyra	800	400		300			1,500
" 11	Yuensang						350	350
" 11	Zafiro	650					500	1,150
" 14	Manila						200	200
" 15	Tean						202	202
" 18	Rubi	800					200	1,000
" 19	Nikko Maru						164	164
" 21	Ambria	2,720					794	3,523
" 1	Isla de Luzon		2,750				46	2,796
" 25	Chingtu					400	40	440
" 25	Shawmut				2,300		200	2,500
" 26	Candia	9,744	3,789				250	13,783
" 29	Wray Castle			20,001				20,001
" 29	Tean	698	150					848
" 31	Sungkiang, Cebú	2,379	300					2,679
" 31	Ambria, Cebú	1,812						1,812
" 31	Candia, Cebú	5,486	1,887				100	7,473
" 31	Wray Castle, Cebú			7,000				7,000
	Total	26,198	9,276	27,001	2,600	400	3,700	69,175

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

MUNICIPAL TELEPHONE SYSTEM, VLADIVOSTOK.—A contract for a municipal telephone system for Vladivostok has been awarded to the Russian branch of a German firm. The annual subscription for a single instrument is to be $38.62 gold.

SUBURBAN ELECTRIC RAILWAY, MANILA.—The Manila Suburban Railway Company, which is an adjunct of the Manila Electric Railroad and Light Company, has secured a franchise from the Philippine Government to build a branch line to Taguig *via* San Pedro Macati, and has been given the right to transport freight, express packages and baggage over its lines.

TIENTSIN ELECTRIC TRAMWAY.—Electric cars are now running through the French Concession at Tientsin. The route is across the International Bridge and through the Rue Courbet, Rue de Baron Gros, Taku-rd and so into the Japanese Concession. The question of continuing the system through the Japanese Concession has finally been favorably settled.

NEW TELEPHONE SYSTEM, BANGKOK.—The Minister of Public Works for Siam has received the sanction of the King to the proposal to acquire and install an entirely modern and up-to-date telephone system in Bangkok. The system decided on is the central battery system. The installation will go to public tender. The Minister is also arranging for a new cable from Koh-Si-Chang to Siracha with connection to Bangkok. When an efficient service is established there, it will be an inestimable boom to the shipping community.

COMPROMISE EFFECTED.—The Yokohama Electric Railway Company and the Buso Electric Company, which have been competing with each other to obtain official permission to build railways to Kamakura along the same route, have arranged a compromise. The Buso people have conceded the line to the Yokohama Electric Railway Company, while the Buso people will construct a new line to Byobugaura from Yokohama, thence to Kamakura and to Misaki along the outer coastline, and thence to Uraga-machi. The surveys are now being carried out.

ELECTRIC RAILWAYS, JAPAN.—The early construction of three electric tramways in the northern portion of the Japanese Island of Kyushu is under contemplation. The first, to be built from Moji to Kokuri, a distance of eight miles, estimated cost $350,000 gold; the second, from Moji to Yawaka, 12 miles in length, at a cost of $500,000, and the third, one of 23 miles, between the important towns of Fukuoka and Kokura, at an estimated cost of $1,250,000 gold. Catalogs should be sent to the Mayor and Chamber of Commerce of the cities of Moji, Fukuoka, Kokura, and Kumamoto.

HYOGO ELECTRIC RAILWAY COMPANY.—The prospectus is now published of this company, which has just obtained a charter from the Japanese Government to construct an electric railway between Hyogo and Akashi. The company's business is to run an electric-car service between these two places, to supply electric motive-power, and engage in all other necessary business. The authorized capital of the company is -Y-2,000,000, in 40,000 shares of -Y-50 each. Of this number only only 5,000 shares are placed on the market the remaining 35,000 shares being taken up by the promoters and patrons.

ELECTRIC TRAMWAYS, SHANGHAI.—In a recent report the Municipal Engineer of Shanghai dealt with the construction of the new bridges across the Whampoo River for the accommodation of the electric tramway. With reference to the New Garden Bridge he stated that in the north dam 40,000 cubic feet of mud had been removed, leaving 2,500′ more to be removed. The dam is remarkably water-tight. Within a foot of the bottom a little water *wells* up in the center and makes it possible that great trouble would have been experienced had the foundation level been a few feet deeper. About 4,000 cubic feet of mud had been removed from the center dam, but it was found impossible to complete the south dam with Oregon pine piles owing to the presence of stones and other obstructions below low water. Hardwood sheet piles were substituted and it was expected the dam would soon be completed. Another year will have passed ere the new Garden Bridge is completed. The Chekiang-rd Bridge is presenting several difficulties. First there was not sufficient sheet piles, and at the time of the report there were 25″ water (pumping) in the north dam, while gas and water mains obstructed pile-driving. Meanwhile the closing of the bridge was causing great inconvenience to thousands of people daily. In the Settlement practically all the tram poles had been *planted*. The track work had been completed in most of the roads and the laying of the junction and curves at the corner of The Bund and Nanking-rd about completed.

STREET RAILWAY AND ELECTRIC LIGHTING PLANT, VLADIVOSTOK.—Consul Roger S. Green, referring to his recent report in regard to the improvements planned at Vladivostok (see The Review for November, 1906) now writes to Washington that the municipality has determined to undertake by itself the construction of the electric street railway and light and power plant. No definite project has yet been adopted, but an engineer is engaged upon plans and estimates. The present intention seems to be not to give the contract for the whole to one firm, but to buy the necessary material from a number of different parties. Persons interested in any kind of street railway and electrical supplies, from dynamos and rails to patent fare registers, etc., should therefore send at once catalogs to the Mayor of Vladivostok, and catalogs with price and other pertinent information either by their own representative or to some local house. Certain material is wanted at once, *viz.*, (1) rails (Phoenix type, with groove for flange of car wheel), a small lot needed to lay on a section of the streets where a new paving is soon to be put down; two grades wanted: (a) rails weighing 42.4 kilograms to the meter, quantity required, 2,455,616 lbs. If this weight can not be supplied, rails weighing up to 45 kilograms to the meter may be substituted: (b) rails weighing 33.5 kilograms to the meter, quantity required, 794,464 lbs. If not obtainable, rails weighing up to 35 kilograms per meter may be substituted. (2) closed cars, having 18 or 20 seats inside and standing room for six persons on each platform, with two motors, each of 20 h. p. and adapted to direct current of 500 volts.

RAILWAYS AND RAILWAY SUPPLIES

IPOH-TRONOH (F. M. S.) LIGHT RAILWAY.—The light railway now being constructed from Ipoh to Tronoh is estimated to cost $1,000,000.

KIANGSI RAILWAY.—A Belgian syndicate has negotiated a 6 per cent loan of Tls. 4,000,000 for the Kiangsi Railway, between Kiukiang and Nanchang.

KOWLOON-CANTON RAILWAY.—The agreement of the Kowloon-Canton Railway has finally been signed and active construction should progress rapidly.

KIRING-CHANGCHUN RAILWAY.—Russians are trying to compete with the railway between Kirin and Changchun by dredging the River Sungari and giving better facilities on that waterway.

RAILWAY OPIUM TRAFFIC, CHINA.—The British Minister at Peking and the Waiwupu of the Chinese Government are reported to be conducting negotiations on the import of opium over the Tientsin-Chinkiang Railway and the Burma-China Railway.

TARLAC (P. I.) RAILWAY.—The Tarlac Railway Company is progressing rapidly in the construction of its line in North Luzon. Five miles of the railway are already in operation, and both passenger and freight traffic over the completed section augur well for the future of the road.

LIGHT STEAM RAILWAY, JAPAN.—A light steam railway is projected to run from Nagasaki, to Shimabara, a port on Shimabara Bay, opposite the Port of Misumi a distance of 26 miles, costing in its construction $325,000 gold. Catalogs of materials should be sent to the Mayor and Chamber of Commerce of Nagasaki.

SOUTH MANCHURIA RAILWAY.—Vice-president Nakamura, and other officials of the South Manchurian Railway, are busily engaged in negotiating with the military authorities for the transfer of the railway, which will take place at the end of the coming March. From April the company will start the work of widening the present gauge of the line.

URGA-SUNGARI RAILWAY.—A Peking dispatch states that as the result of negotiations carried on between Viceroy Yuan Shihkai and the Minister for Urga in the Department of Posts and Telegraphs, the Chinese Government has decided to construct the Urga-Sungari Railway, appropriating $500,000 from the proceeds of the Peking-Hankow and Peking-Tientsin railways as a starter fund.

TIBET ROPEWAY COMPANY, LTD.—A concern has been formed under the name of *The Tibet Ropeway Company, Ltd.*, for the purpose of carrying goods by means of a wire-rope tramway at a lower cost and much quicker than they can be transported in any other way from India into Tibet. The company's prospectus says that a concession has been secured from the Government of India, and the details given of the estimated expenditure and revenue indicate a return of 20 per cent dividend on the undertaking, even on the basis of present trade, which, with improved and cheaper transport, will be sure to expand almost immediately.

SHANGHAI-KASHING RAILWAY.—Work on the construction of the Shanghai-Kashing Railway has begun outside the Great South Gate of the Shanghai Native City. The Kingsu Railway Company will construct this line the route of which will be from outside the Great South Gate to Fengchingchen on the Kiangsu-Chekiang border, a distance of about 35 English miles. From Fengchingchen westward the Chekiang Provincial Railway Company will take up the work and connect the line with the City of Kashing and thence to the capital of the province, Hangchow. This railway is considered to be a very important one to the trade interests of this section of China.

EASTERN SIBERIAN RAILWAY.—M. de Lobel, a French noble, in consonance with the Russian Court Party, has secured the right to construct the Eastern Siberian Railway. The line will be constructed both from the western terminus of the Siberian Railway and Behring Strait to connect with the Behring Strait Railway, the underground line proposed by an American syndicate from Alaska. M. de Lobel is said to be working for the syndicate. The terms of the agreement with the Russian Government are the payment to the latter of 200,000,000 roubles, the continuance of the concession for 93 years and the privilege of working the numerous mines in the region the line will tap.

SEOUL-FUSAN RAILWAY.—The report of the Seoul-Fusan Railway Company for the first half of the year 1906 gives the following particulars of the company's affairs at the close of that period:—Government subsidy, -Y-450,000; cash transferred from Reserve of the Seoul-Chemulpo section, -Y-107,352.30, and cash transferred from the Reserve for equalizing dividends, -Y-1,780.70, making a total of -Y-550,123. Of this sum, -Y-109,133 is appropriated to make good the losses sustained; -Y-450,000 is paid to shareholders as an interim dividend at the rate of 6 per cent *per annum*. The price of the company's shares now stands at -Y-94. After the railway is sold to the Government the amount to be realized per share by shareholders will be -Y-39.30, setting off the expected expenses incurred in the liquidation and repair work.

CANTON-HANKOW RAILWAY.—Mr. A. E. Smith, American Consul at Victoria, B. C., reports that it is current among the Chinese of that city that $50,000,000 have been raised—largely in Canada and the United States—for the construction of the Canton-Hankow line. The principal promoter in Canada is a Chinese known as Charlie Yip Yen, long a resident of British Columbia. In company with others he has traveled largely over the United States and Canada, and everywhere has been successful in raising funds for this project. Four million dollars of the capital were subscribed by Chinese residents of Vancouver, Victoria, New Westminster, Montreal, and other points in Canada; while many more millions have been subscribed by Chinese living in New York City, Chicago, San Francisco, and other cities of the United States.

CHINESE RAILWAYS.—Loans so far arranged by China for railway construction, are detailed by Mr. George Jamieson in a financial article dealing with foreign investments in Chinese railway loans. They are all guaranteed by the Imperial Government of China, and are further specifically secured by a mortgage of the particular railway in respect to whch they are issued. The loans are as follows:—British 5 per cent (£2,300,000) on the Peking-Shanghai-Kuan line; Belgian 5 per cent (Fcs. 112,500,000), on the Peking-Hankow line; Russian 5 per cent (Fcs. 40,000,000), on the Chengtin-Taiyuenfu line; Belgian 5 per cent (Fcs. 40,000,000), on the Kaifeng-Honanfu line; British 5 per cent (£800,000 issued to the Peking Syndicate, Ltd.), on the Taickow-Chinghua line; British 5 per cent (£3,250,000), on the Shanghai-Nanking line; British 5 per cent (£21,500,000 about to be issued), on the Canton-Kowloon line.

SWATOW RAILWAY.—The official report of the Swatow Railway, China, which has been published, confirms the main indictment, according to the *North China Daily News*, which everyone with eyes in his head has been able to bring against the work—the insufficiency of the mud embankment, and sand patching and ballast to stand the onslaughts of the tropical rains which are common there. In some places the sleepers float in a bed of sand. The report forecasts the opening of three other stations, and the building of a depot at Swatow. Attention is also called to the large number of Japanese employed first of all in the construction, and now in the management of the railway; but notices that some Chinese have been sent to Formosa to learn the railway business. Five thousand six hundred dollars (Mexican) are given as the daily receipts, and a raise of $1,000 per day as soon as the freight traffic is opened, is forecasted. At present there is a persistent rumor that the line is being run at a loss.

RAILWAY IN SZECHUEN.—A telegram from Berlin, published in the *South China Morning Post*, announces that China has given her consent to the construction of a railway line in the Province of Szechuen, and that the cities in this province are to be opened to trade. Szechuen, of which the provincial capital is Chingtu, has an area of 166,800 square miles and an estimated population, according to Chinese official data, of more than 67,712,897. It is one of the most populous provinces in China, and is one of the richest in respect to minerals. The people will build their own railway and surveys have been conducted with a view to finding a practicable route for a railway to connect Burma with the Yangtsze region in Szechuen, and it is anticipated that a definite project for such a line will, now that the Government sanction has been obtained to the introduction of the railway, shortly be launched. The French also desire to carry their Yunnan Railway to Chingtu, thus connecting the capital of French Indo-China with the Capital of Szechuen.

YUET-HAN RAILWAY.—The following significant notice has been published by Cheng Koon Ying, president of the Kwang-Tung Mercantile Administration of the Yuet-Han Railway Company, Ltd., dated at Canton, January 21st, 1907:—"All materials of whatever description purchased by this railway company are to be paid in full on net price strictly free of commissions or returns. This has been already notified in the local papers. Owing to rumors to the contrary being recently in circulation, the undersigned begs to repeat this for the information of the public that in the event of any employé of this railway company who may fraudulently ask the dealer to invoice any goods at an excessive price, or receive commissions, etc., when once brought to light, he shall be heavily fined and severely dealt with. Any dealer transacting business with this railway company who facilitates any employé to commit such a fraud, which amounts to a breach of faith, his name and the name of his firm shall be advertised in the paper and no more business shall be transacted with him and his firm by this railway company in the future."

SOUTH MANCHURIAN RAILWAY ORGANIZATION.—Mr. Luke E. Wright, American Ambassador at Tokyo, has transmitted to the Department of State at Washington a revised copy of the translation of an order by the Government of Japan relating to the organization of the South Manchurian Railway Company. The company is authorized by the order to engage in the traffic of the following railways:—Tairen-Changchun, Nankuanling-Port Arthur, Tafangshen-Liushutun, Tashi-ciao-Yingkou, Yentai-Yentai Coal Mine, Sukiatun-Fushun, Mukden-Antunghien, all of which must be changed to the 4′ 8.5″ gauge within three years from the date on which the company commences its operations. The company is authorized to engage in the following accessory lines of business:—Mining, especially the operation of the coal mines at Fushun and Yentai; water transportation; electrical enterprises, warehousing, etc. The total amount of the capital of the company shall be -Y-200,000,000, -Y-100,000,000 shall be furnished by the Japanese Government, and shares now owned by the Government shall be open to subscription by Japanese and Chinese subjects. The company will have its head office at Tokyo and its branch office at Dalny.

PUBLIC AND PORT WORKS, DOCKS, WHARVES, ETC.

TSINGTAU IMPROVEMENTS.—The budget of the German Colony of Tsingtau for 1907 provides for the expenditure of 2,300,000 marks on harbor improvements and 1,000,000 marks on the construction of roads, etc.

BRIDGES AT CANTON.—The Canton River Bridge Company, Ltd., is the name of the newly-organized concern with a capital of $1,000,000 that will undertake the construction of three bridges across the river at Canton. The bridges will be 75′ high from the water level and the first structure will be erected near Yaulan-mun. The company's offices and workshops are on a site near the beach.

TARLAC (P. I.) DYKE.—The Philippine Commission has authorized the expenditure of ₱20,000 out of the United States Congressional Relief Fund, or as much as may be necessary, for the Tarlac dyke, in the municipality of Tarlac, Province of Tarlac, North Luzon, from the site of the old Government building to a point 600′ beyond the conjunction of the Tarlac-Victoria-rd and the Tarlac railroad station.

WATERWORKS FOR VLADIVOSTOK.—The question of a waterworks system for Vladivostok is soon to be taken up for consideration. It is suggested that manufacturers of supplies which will be required for such an undertaking make arrangements with some local firm to keep in readiness the necessary information so that when the favorable moment comes prices can be obtained by telegraph and a definite proposal submitted without delay.

NANNING IMPROVEMENTS.—The land to the south of Nanning, where the Chinese Imperial Maritime Customs and European godowns, etc., are to be located, is being levelled off and laid out in fine roads. A stone wall will be built along the riverfront for several hundred yards, thus giving a striking appearance to this far-inland treaty port. Over 300 workmen are engaged at the present time, at an average wage of 25 cents (Mexican) per day, rice included.

ROAD CONSTRUCTION, PAHANG.—The first installment of $50,000 has been appropriated by the Government of the State of Pahang, F. M. S., for the Benta-Sepan section of the main trunk road from the Ulu to the east coast. A cart road will be constructed from Benta, a point on the Pahang trunk road 16 miles from Lipis, to Kuantan. This will be a large undertaking in road-building, the distance being estimated at 150 miles. The line of this road will pass through some of the richest agricultural and mineral lands in Pahang.

SINGAPORE HARBOR IMPROVEMENT.—According to the *Singapore Free Press*, it is estimated that between 3,000 and 4,000 gals. of Jodelite will be used by the contractors, Sir John Jackson, Ltd., for treating the timber to be utilized in connection with the improvement of the Singapore Harbor. The contractors have used this preservative for similar work in many parts of the world and its efficacy in thoroughly protecting every kind of timber against the attack of white ants, teredos, dry rot and decay is no longer in doubt.

GRAVITY WATER SUPPLY, MANILA.—The two tunnel heads of the new water supply main, now being constructed at the headwaters of the Mariquina River for the City of Manila under the supervision of Major Case, Chief Engineer of Sewer and Waterworks Construction, have been connected and the tunnel is now complete. All that now remains to be done is the laying of the 42″ steel pipe which shall conduct the water from the new reservoir to the city. The tunnel connects the dam, 60′ high by 400′ in length on the crest, which closes the gorge in which 2,050,000,000 gals. of reserved water supply are to be held in readiness for Manila's use. The 4½ mile tunnel is fast being completed, 1½ miles being at present finished.

MADRAS HARBOR IMPROVEMENTS.—The new boat basin which is included in this scheme has been completed and has been brought into use, one beneficial result being the introduction of large self-propelling lighters which it had been impossible heretofore to introduce. A new import pier, well equipped with hydraulic cranes capable of dealing with 2,000 tons of cargo per day, will soon be started. The pier will lead into the new Customs shed with an area of 80,000 square feet. The new dredger *Triton*, purchased from Ceylon, is working satisfactorily. All the berths in the harbor have been dredged now and have a depth of 28′ at low water. New low-level passenger piers have been completed. The new extension works in connection with the opening of the northeast entrance with a protecting groyne, are progressing and it is contemplated will be completed in 1910.

PUBLIC WORKS APPROPRIATIONS, PHILIPPINE ISLANDS.—The Philippine Commission has made appropriations for public works and permanent improvements, as follows:—For the extension of the water supply system at the Culion Leper Colony, ₱10,000; for the purchase of land adjoining the Exposition Grounds Manila, ₱21,028.75; for the purchase, from settlers, of improvements and rights to land required for the Iwahig Penal Settlement, ₱1,079.80; for the construction of necessary hospital buildings and their permanent equipment, for the Bureau of Prisons, ₱100,000; for the construction of buildings and their permanent equipment on the San Lazaro Hospital grounds, to provide for the care of 250 additional insane persons, ₱55,000; for the construction of provincial schoolhouses, to be allotted by the Secretary of Public Instruction, ₱300,000; for the construction of Constabulary barracks and quarters, ₱100,000; for the improvement of the trail through the mountains, connecting the completed Cebu, Toledo-rd, ₱5,000; for the reconstruction of retaining wall and wharf along the Pasig River at Malacañan, and alterations in the Governor-General's residence, ₱15,000; for grading grounds pertaining to the buildings occupied by the Bureau of Science, Manila, ₱4,060; for the construction of a residence for the Governor-General, at Baguio, Benguet, ₱30,000; for the construction of a building for the employés of the Bureau of Public Works, at Baguio, ₱5,000; for the expenses of investigations in regard to the improvement of the Port of Manila and other harbors, ₱5,000; for the construction of abutments for two wharves at the Port of Manila, ₱15,000; for the completion of the Luneta Extension fill, ₱134,306; for the construction of a sewer system for Bilibid Prison, Manila, ₱20 000; for permanent, sanitary beds for inmates of Bilibid Prison, ₱20,000; for the payment of expense of construction of warehouses at the Iwahig Penal Settlement, ₱1,700. The unexpended balance of funds for the completion of the road from Baguio to Trinidad, Benguet, is made available for expenditure as road and bridge funds for the Province of Benguet. Total appropriations for all purposes, ₱835,472.50.

SHIPBUILDING AND GENERAL MARINE MATTERS

OSAKA SHOSEN KAISHA.—The result of the workings of this company for the latter half-year of 1906 was unsatisfactory and no dividend will be paid for the period.

OSAKA SHOSEN KAISHA.—This steamship company intends to build two steamers of about 10,000 tons each with a view to opening a regular service between America and Japan.

LAUNCH OF STEAMER "EMERAUDE," HONGKONG.—The *Emeraude*, the second of four stern-wheel steamers built or building at the Hunghom establishment of the Hongkong and Whampoa Dock Company, has been successfully launched.

HONGKONG AND WHAMPOA DOCK COMPANY, LTD.—Subject to audit, the directors of this company will recommend at the forthcoming annual meeting of shareholders a dividend of 12 per cent, equal to $6 per share; pass $50,000 to Special Account and carry forward about $393,000.

STEAMER "BAN HONG LONG."—The trial trip of the steamer *Ban Hong Long*, the latest addition to the Singapore-Bangkok line, took place recently. The steamer was built on order of Messrs. Howarth Erskine, Ltd., of Singapore, and is essentially a cargo boat with a net register of 709 tons. She is capable of carrying 1,400 tons of cargo. She is owned by Mr. Low Kiok Chiong, of "Chop" Ban Hong, and on her trial trip she covered the measured mile at a mean speed of 11.387 knots.

NEW HOLT LINER "TITAN."—The new liner *Titan*, which arrived in the Far East recently from Liverpool on her maiden voyage, was built in 1906 for the Ocean Steamship Company, Ltd., by Messrs. D. and W. Henderson & Co., of Glasgow. She is sister ship of the *Cyclops* and *Bellerophon*, and about 9,000 tons gross. Her holds have seven compartments for heavy machinery and bulky goods. She has no masts or sails. There are four tall, powerful posts which act as derrick-posts, and hold ventilators two abreast, fore and aft.

MITSU BISHI DOCKYARD AND ENGINE WORKS, NAGASAKI.—Mr. H. Shoda, General Manager of the Mitsu Bishi Dockyard and Engine Works, has been transferred to the head office of the company at Tokyo, and been succeeded by Mr. H. Maruta, Assistant General Manager. The new General Manager spent some years in England studying shipbuilding and was a long time at the Mitsu Bishi Dockyard and Engine Works as Works Manager. When the Kobe yard was opened in 1905. he succeeded Mr. R. Midzutani as Assistant General Manager at Nagasaki, and has now reached what must be considered one of the most important positions in the Japanese shipbuilding world.

CAPE VARELLA WRECKS.—The Hongkong and Whampoa Dock Company's powerful tug *Robert Cooke*, and the Norddeutscher Lloyd's steamer *Wong Koi*, are still high and dry on Cape Varella beach. The tug is lying alongside the steamer and is full of water from the waves that have been continually rolling over the vessel. As far as is known there are no holes in the plates of the tug's hull. Hope of saving either stranded vessel has about been abandoned. In spite of the great inconvenience the Hongkong dock company is put at on account of the stranding of the *Robert Cooke*, its floating plant is equal to all emergencies. The powerful launches *K6* and *K7* have been called into service to replace the tug. These are being assisted by the auxiliary vessels *Edith* and *C1*. The *K7*, a new boat, has already done excellent harbor duties.

SEATTLE-CHINA STEAMSHIP SERVICE.—It is announced that North China ports are to have direct communication with Seattle. Messrs. Frank Waterhouse & Co. and Andrew Weir & Co. have arranged to begin jointly the operation of the new line immediately, using six steamships carrying from 5,500 to 12,000 tons, the latest type of the ocean freighter. A regular service is to be given between Puget Sound ports, British Columbia and Hakodate, Vladivostok, Dalny, Chefoo, Taku Bar and Newchwang, calling either way at Chemulpo, Chinampo and other Korean ports, when the inducement warrants sending the vessels there. The vessels to be used on this run are the *Gymeric* (6,200 tons), the *Boveric* (7,200 tons), the *Inveric* (7,200 tons), the *Aymeric* (8,200 tons), the *Suveric* (12,500 tons), and the *Quito* (5,500 tons). The *Suveric* and the *Gymeric* have been dispatched from Seattle and this (February) month the *Boveric* and the *Quito* are clearing. The *Inveric* is scheduled to sail in March. The *Suveric* and the *Boveric* were launched in 1906, and the *Gymeric* was put in commission in 1905. The *Quito* and *Gymeric* were built in 1900, and the *Inveric* in 1901.

KAWASAKI DOCKYARD COMPANY, KOBE.—At the recent general meeting of the Kawasaki Dockyard Company, a resolution was adopted to add to the company's business the manufacture of steam engines, railway carriages, tires, axles, electric motors, military arms and steel products, and an amendment to the Articles of Association covering the resolution was agreed upon. The net profits of the company for the last half-year amounted to -Y-459,639, including a surplus of -Y-53,367. Of this sum -Y-50,000 has been placed to the Reserve Fund and -Y-20,000 to the Special Reserve for the depreciation of building and machinery. -Y-226,000 was set aside for dividend, and -Y-56,800 for extra dividend, making a total dividend 12.56 per cent *per annum*. -Y-20,000 was devoted for bonuses to officials the balance being carried forward.

MINING, MINERALS AND THE METAL TRADES

OIL IN SIAM.—Petroleum is found in Muang Fang in the extreme north of Siam. Oil is also reported in Kedah. Siam petroleum is black in color and very viscous. It is supposed that the occurrences are geologically connected with the oil-fields of Burma.

KELANTAN GOLD DREDGING COMPANY, LTD.—This company has gone into voluntary liquidation with Mr. Cecil James Barnes, of 15 George-st, Mansion House, London, as liquidator for the purpose of winding up the business.

GOLD IN MINDANAO, P. I.—Gold in paying quantities has been discovered near Zamboanga, the capital city of the Moro Province, Philippine Islands. Surface washings show good returns in the mountains nearby. Several American miners are now prospecting the country.

AMERICAN MINING PROJECT, SIBERIA.—Mr. Lebedeff, a mining engineer, who has been engaged by a group of Russian and American capitalists and engineers, has found at the source of the Biryussa and other rivers of the Nizhneoudinsk District a vein of gold and copper manganese ore.

PETROLEUM PRODUCT OF JAPAN.—The petroleum produced in Japan is only sufficient to meet a quarter of the demand in the Empire, the remainder being supplied by Russia and America. The value of the oil imported amounts to about -Y-16,000,000 *per annum*, of which -Y-10,000,000 represent Russian oil and -Y-6,000,000 American oil.

CHINA AND MANCHURIAN COAL-FIELDS.—The Chinese Government has again demanded that the Japanese return the Fushun and Yentai mines to Chinese control in April next, the date on which the Japanese agreed to withdraw all troops from Manchuria. The Chinese also demand the return of the Penchihu mine now being worked by the Japanese firm of Okura.

MACHINE OIL WORKS, EAST BORNEO.—It was recently announced that the Royal Langkat Petroleum Company intended to establish extensive machine oil works at Singapore, but now that the owners have obtained a controlling interest in the Shell Company, another idea finds favor, and the works will be established in East Borneo on the concession of the Shell Company.

WEIHAIWEI GOLD MINING COMPANY, LTD.—At a recent extraordinary general meeting in Shanghai, the stockholders of this company adopted a resolution to the effect that it having been proved to the satisfaction of the shareholders that the company could not by reason of its liabilities continue in business, the company would voluntarily wind up the concern. Mr. Louis Rudolph Burkhardt, of Shanghai, was appointed liquidator.

SIAMESE TIN SYNDICATE, LTD.—This company has been registered in London by Messrs. Francis & Crookenden, 3 New Square, Lincoln's Inn, W. C., with a capital of £120,000 in £1 shares. The object of the company is to acquire mining claims, licenses, leases, concessions and rights, mill sites and water, petroleum and other rights and properties in Siam or elsewhere, and to carry on the business of tin and general miners, explorers, metallurgists financiers, promoters, etc.

KINTA TIN MINES, LTD.—At the sixth annual general meeting of the Kinta Tin Mines, Ltd., held recently in London, it was announced that the production of ore on this property increased during the year under review from 2,988 piculs to 3,238 piculs, and the average price obtained was better by $3.76 per picul, resulting in an increase of $23,764. The net profit was £15,247 3s 5d. Against this interim dividends amounting to 17 per cent were paid, and a final 2½ per cent for the year.

AUSTRALIAN GOLD PRODUCTION AND EXPORTATION.—Australia's gold production for the eight months ended August 31st, 1906, amounted, approximately, to 2,306,532 fine ounces, of the value of about $47,704,840 gold, against 2,388,044 fine ounces, of the value of about $49,390,108 for the corresponding period in 1905. The net decrease was 81,512 ounces. Increases are shown by Victoria and New South Wales and decreases by Queensland and Western Australia. The shipments of gold during the first nine months of 1906 show an increase of $28,366,531 gold over those of the corresponding period of 1905.

MINING IN SHANSI.—The Office of Mining Affairs at Hsianfu has, through the medium of the Chinese Minister at Tokyo, engaged an experienced Japanese mining engineer for a period of one year, for the working of the rich petroleum oil mine in the District of Yenchanghsien. The sanction for working this mine was obtained some time ago from the Throne. Besides the engineer six other Japanese have been engaged in connection with the mine's development, and the foreign party has arrived at Yenchang to begin operations. This mine is said to have been discovered by a European engineer several years ago, and his request made of the Chinese authorities at the time for permission to work the property was refused.

HEILUNGCHIANG GOLD MINES.—These mines, which ever since the Boxer trouble have been in the hands of the Russians, are to be handed back at cost to China. In this connection a Chinese Taotai, who has been appointed superintendent of the mines in question accompanied by eight interpreters and assistants, 20 miners from the Kaiping Colliery and a regiment of armed troops, left Tientsin for Hailungchiang Province, *via* Mukden, to take over the property. The party also took along 2,000 extra Mauser rifles with sufficient ammunition to arm two other regiments to protect the miners from lawless raids of Russian outlaws and Chinese mounted bandits. The mines are said to be exceptionally rich in the precious metal.

SILVER MINING, SOUTH CHINA.—Some years ago, says the *South China Morning Post*, a Chinese syndicate, with more capital than brains, started to exploit the Sam Cha silver mine in Kwai-Shen, which is about 300 miles from Wuchow. As no European mining expert was allowed to be employed, the enterprise turned out a failure. After an interval, a second syndicate was formed, but, owing to the same restrictions, it failed also. Over $1,000,000 are said to have been sunk in the venture, yet the mine is believed to be one of the richest in the world. Now the Taotai, at the request of the shareholders, has petitioned Peking to allow the services of a foreign expert to be retained, and this has been granted. A third syndicate has, therefore, been formed, and a contract entered into with a well-known eastern banking company to advance money to obtain the necessary plant for pumping, etc., the security being made up, the first and second companies being responsible for 25 per cent each of the loan, and the third the remaining 50 per cent.

SIBERIAN COAL AND IRON.—Large deposits of anthracite coal have been discovered in the Russian territory of the Orenburg Cossacks. The depth is only 56" and the vein extends about 133 miles north and south, and at about the same distance in a southerly direction from the great Siberian Railroad. The great value of this discovery lies in the following facts:—(1) The proximity of the coal fields to the Ural iron and steel industry, which is at present mainly dependent upon wood and charcoal for fuel, and therefore otherwise incapable of further expansion. (2) In view of the probable early exhaustion of the South Russian iron-ore mines, estimated to take place in about 30 years, the Ural District is destined to become the greatest producer of iron and steel in the Russian Empire; the above newly-discovered coalfields will therefore become of inestimable value to the district. (3) The discovery in the neighborhood of the coal-fields of deposits of brown hematite, an ore well adapted for smelting purposes.

FINANCIAL AND MISCELLANEOUS

BANQUE DE L'INDO-CHINE BUILDING, BANGKOK.—Messrs. Howarth Erskine, Ltd., of Singapore, are erecting a magnificent building for the Banque de L'Indo-Chine, in Bangkok.

FLOUR MILLS, CHINA AND MANCHURIA.—The establishment of a flour mill at Hankow, China, and mills in Manchuria is under consideration.

ICE-MAKING ENTERPRISE, NAGOYA, JAPAN.—A scheme is on foot in Nagoya for establishing an ice-making concern, with a capital of ¥300,000. The new venture will probably take up a cold-storage business in addition to the production of ice.

AMALGAMATION OF JAPANESE SPINNING COMPANIES.—Negotiations between the directors of the Kanegafuchi Spinning Company and the Nippon Silk Spininng Company with a view to the amalgamation of those concerns, are reported to be making favorable progress.

CHINA VENTURE SYNDICATE, LTD.—This company has been registered in London with a capital of £2,000, in £1 shares. It will carry on the business of financiers, company promoters, bankers, underwriters, concessionaires, contractors, miners, prospectors, etc.

FLOUR MILLS, JAPAN.—Many large flour mills have been projected in Japan. Those of the Imperial, the East Asia, and the Meiji Flour companies will most probably be located at Tokyo and it is estimated will, with other new companies, produce 3,000 sacks daily.

SUGAR INDUSTRY, FORMOSA.—Manufacturers of sugar machinery are watching developments in Formosa, where the sugar industry is growing rapidly. Within the next few years many large mills will be constructed. With the growth of this industry there will also be a demand for light railway materials.

YOKOHAMA STORAGE COMPANY.—This company required over ¥8,000,000 capital in order to undertake reclamation work and the building of wharves capable of accommodating vessels of 25,000 tons. It is therefore considering either the acquisition of a loan from a German syndicate or the increase of its present capital of ¥3,500,000 to ¥10,000,000.

LAND RECLAMATION COMPANY, HONGKONG.—The company has declared a dividend of $7 per share, which will absorb about $33,000 of the balance brought forward from 1905. The directors of this company are Messrs. W. J. Gresson, Sir Paul Chater, A. J. Raymond, D. M. Nissin, Ho Tung, and Shellim. The auditors are Messrs. W. Hutton Potts and A. O'D. Gourdin.

EASTERN EXPLORATION COMPANY, LTD.—This company has been registered in London with a capital of £5,250, in 5,000 ordinary shares of £1 each and 500 deferred shares of 1s. each. Its object is to carry on in the United Kingdom, China and the Far East, and elsewhere, the business of explorers, financiers, agents, contractors, concessionaires, bankers, merchants, etc.

WEST POINT BUILDING COMPANY, LTD., HONGKONG.—The result of the workings of this company during 1906 show a net profit of $52,546.69, as against $45,700.76, for 1905, which enables the company to declare a dividend of $4.10 as against $3.65 for 1905. The new Board of Directors consists of Sir Paul Chater (chairman). Messrs. W. J. Gresson and A. J. Raymond. The Auditor is C. W. May.

CONCRETE BUSINESS BLOCK, MANILA.—The American Hardware Company, Manila, has purchased the Helios Cigar Factory site on calle Echague and will soon begin the construction thereon of a splendid reinforced concrete business block for its own accommodation. Manager Henry C. Jones promises that the new structure will be the finest commercial building of its kind in the Orient.

CHINA PROVIDENT, LOAN AND MORTGAGE COMPANY, HONGKONG.—This company pays a dividend of $8 per share on its business for 1906 and places $15,000 to Reserve. Dr. J. W. Noble and Messrs. J. S. Van Buren, H. P. White and Chow Hing Kee have been reëlected to the Consulting Committee for the Current year. Messrs. A. O'D. Gourdin and W. Hotton Potts have been reëlected auditors.

PHILIPPINE AGRICULTURAL BANK SCHEME.—The House of Representatives of the American Congress has received a favorable committee report on the bill to guarantee interest in the sum of $200,000 gold for an agricultural bank in the Philippines. Should the bill become a law it will admit of the establishment of a system of private agricultural banks, with an aggregate capital of $5,000,000 gold.

KOWLOON LAND AND BUILDING COMPANY, LTD. HONGKONG.—The balance of Profit and Loss Account for the year 1906, after writing off all charges and expenses, amounts to $16,639.15. A dividend of $2.50 per share has been declared, which, after writing of the directors' and auditor's fees leaves a balance of $1,089.15 to the credit of the new Profit and Loss Account. Messrs A. Rodgers and W. H. Gaskell are reëlected directors Mr. C. W. May has been reëlected auditor.

LEAD PAINT MANUFACTURE, JAPAN.—Owing to the remarkable increase in the demand for lead paint, the plant of the Japan Paint Company, of Tokyo, has proved inadequate to execute the orders received. This company recently commenced to make varnish, and has also discovered a new process for extracting lead from a certain ore for use as raw material in paint making. The Board of Directors has doubled the $250,000 gold capital and is extending the Osaka factory.

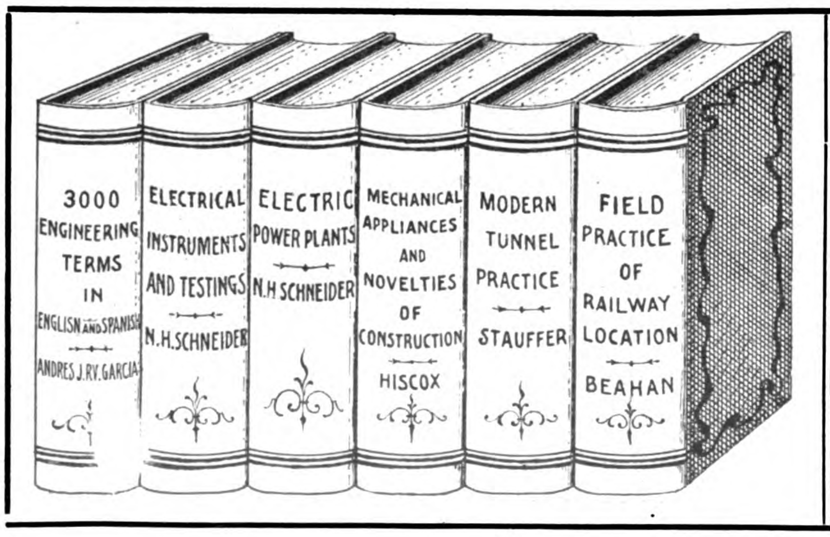
PRISON LABOR FOR PHILIPPINE PROVINCES.—The Philippine Commission has passed the necessary legislation authorizing provincial boards to cause all able bodied prisoners except such as are held as witnesses or awaiting trial, to work on any of the public roads or highways or other public works, or to clean, care for or repair public buildings or grounds in the province where such prisoners are confined. The prisoners will wear their prison garb and be under sufficient guard to prevent their making their escape.

WELL-BORING IN PAMPANGA PROVINCE, P. I.—Numerous artesian wells have been sunk in Pampanga Province recently. Eight wells have been drilled in the City of Pampanga. One in Bacolod with 115' of piping was drilled at a cost of ₱1,813, or an average of ₱15.77 per foot. In Guagua, Lubao, Macabebe, and San Fernando wells have also been drilled with success, the cost of those in the last-named place being the most expensive, averaging ₱24.10 per foot. The average cost of all the wells drilled in the province was ₱19.24.

JAVANESE LABOR MARKET.—The labor market for Javanese emigrants abroad shows a steady increase in demand. Hitherto Javanese coolies mainly went to the Straits Settlements, according to the *Penang Gazette*, and the Federated Malay States. Recently the *Java Government Gazette* contained a notification allowing coolies to be recruited there for planting and mining in New Caledonia, and for rubber cultivation in North Borneo and German New Guinea. The Manchester North Borneo Rubber Company alone got leave to recruit 300 coolies.

FORMOSA'S FOREIGN TRADE, 1906.—The Viceroy of Formosa has telegraphed to Tokyo the following figures with regard to the island's foreign trade in 1906:—Exports, ¥9,386,170, a decrease of ¥1,318,976 from 1905; imports, ¥12,366,944, an increase of ¥1,403,067 over 1905. The excess of imports over exports was ¥2,980,774. Export of gold and silver ¥2,181,729, an increase of ¥952,673 over 1905; import, ¥24,329, a decrease of ¥430,732 from 1905. The excess of exports over imports was ¥2,157,400. The total tonnage of ships entered was 316,203, an increase of 63,043 tons over 1905; of ships cleared, 311,850, an increase of 57,031 tons over 1905.

PHILIPPINE HEMP MACHINE COMPANY.—This company was organized in Manila recently with a capital of ₱150,000 ($75,000 gold), under the laws of the Philippine Islands. The incorporators are Messrs. M. A. Clarke, J. S. Gillies, Franklin G. Colby, Benito Legarda, John Gibson, M. L. Stewart, W. H. Anderson, John W. Haussermann, D. R. Williams, Frank A. Crowhurst, James F. Macleod and Charles A. Reynolds, and Major George P. Ahern. The company will promote the *Gillies Process* of extracting the *abacá* (hemp) fiber, as demonstrated by the Gillies machine. This machine will weigh about 200 lbs. when equipped for artificial power and about 100 lbs. equipped for hand-power. Mr. Gillies is now in the United States superintending the construction of the machines.



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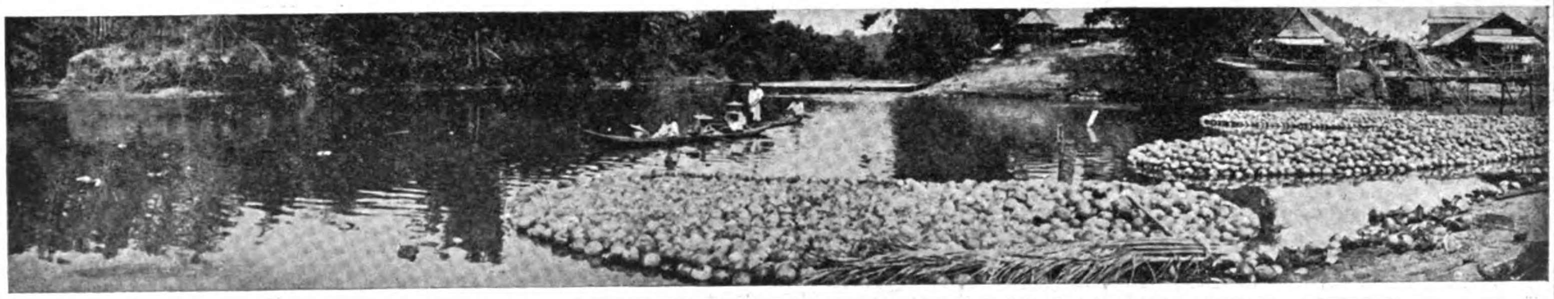

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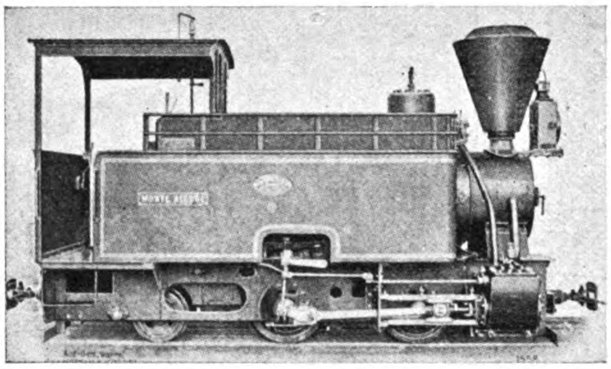

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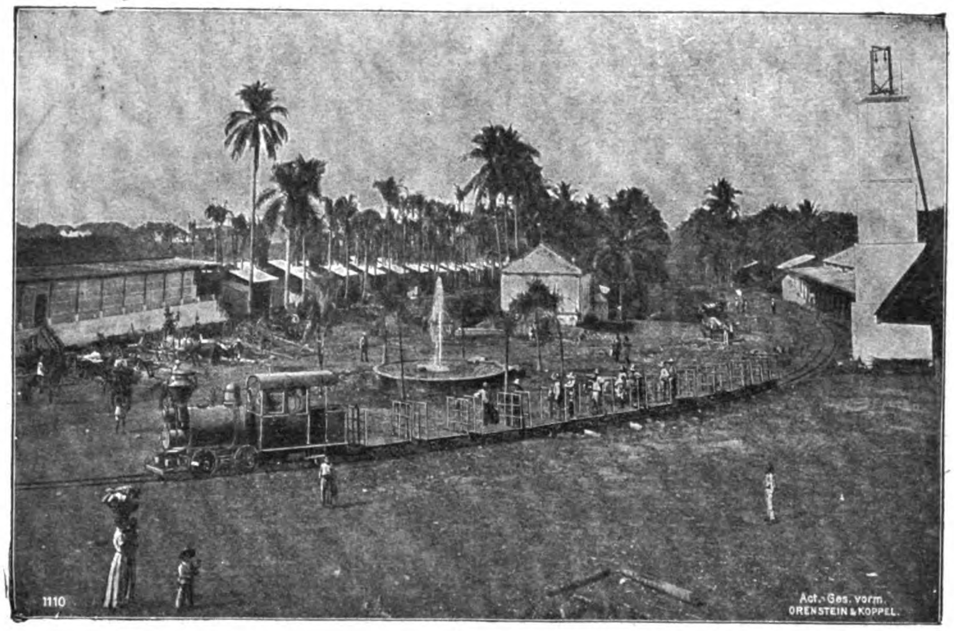

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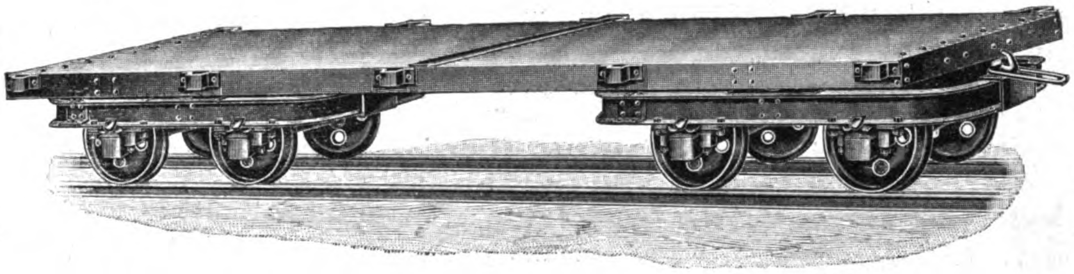

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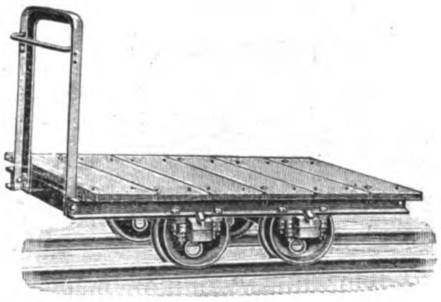

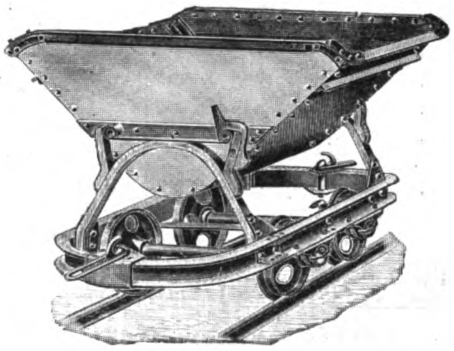

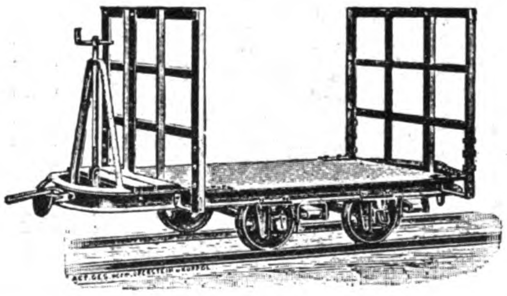

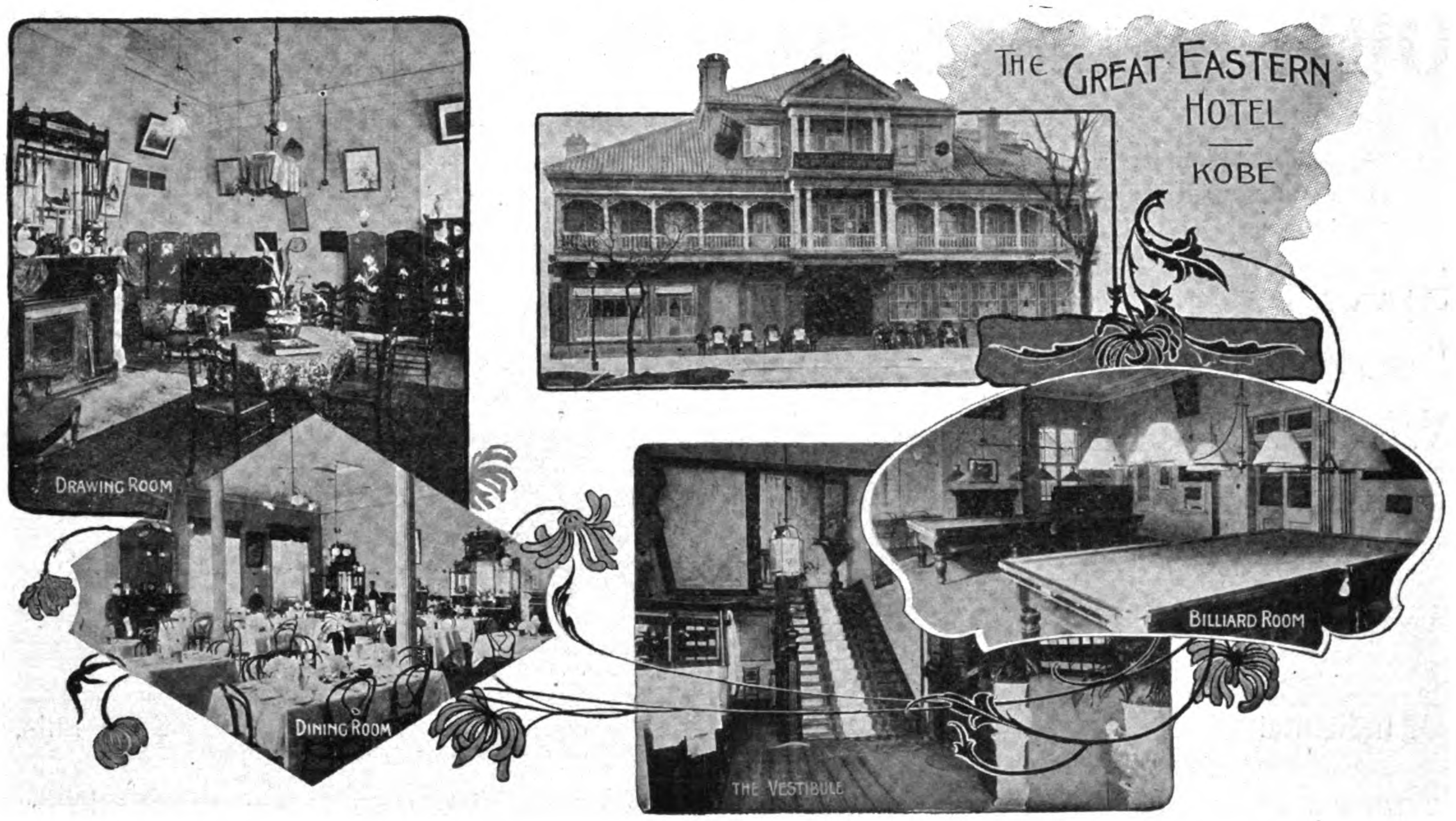

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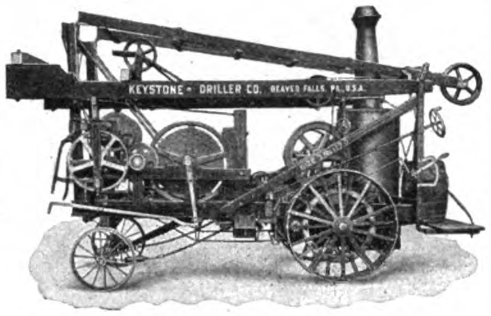

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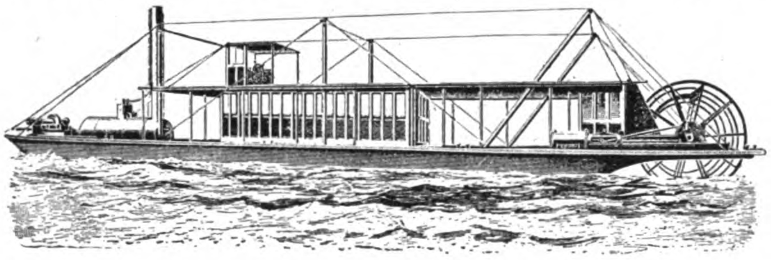

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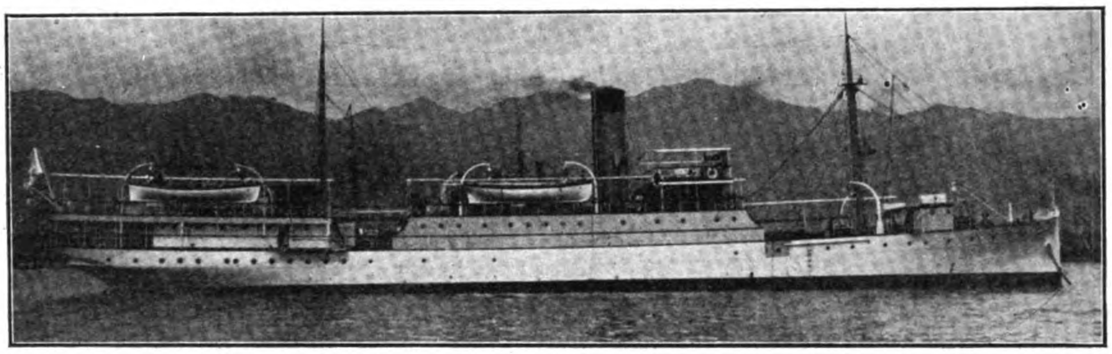

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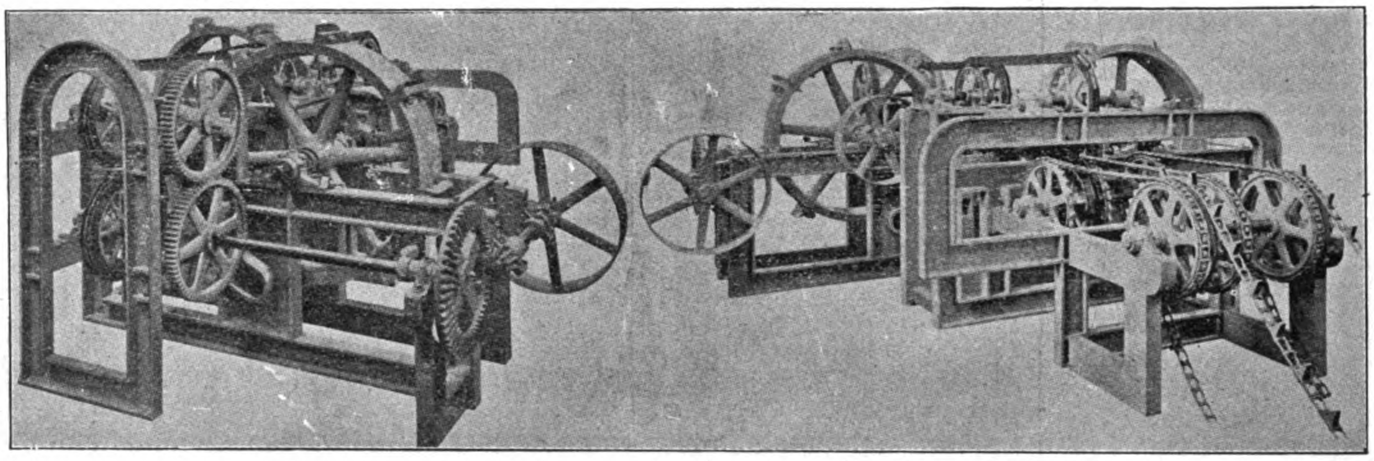

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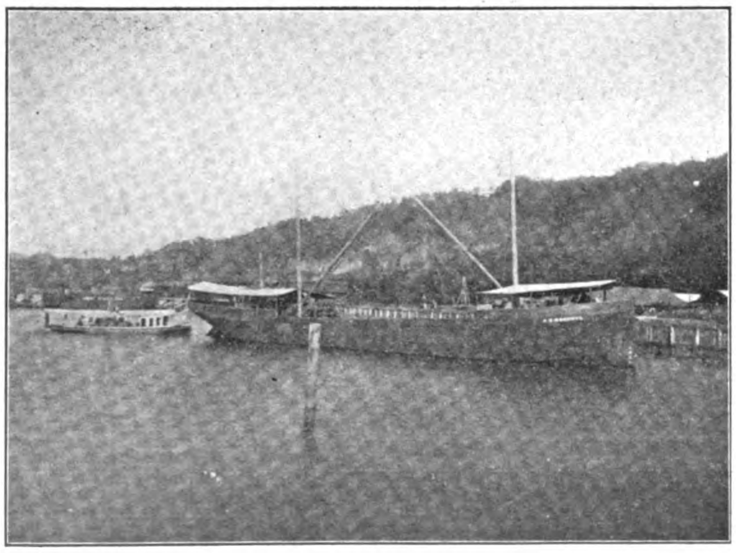

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THE FAR EASTERN REVIEW

COMMERCE ✪ ENGINEERING ✪ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, MARCH, 1907. No. 10.

PRACTICAL DESIGN OF ARCHES AND NOTES ON REINFORCED CONCRETE CONSTRUCTION

With Special Reference to Tropical Conditions in the Orient

(*By J. C. KOCH, Assistant Engineer, Bureau of Public Works, Manila*)

The principal advantages gained by reinforcing concrete arches with steel are stated as follows in Buel and Hills' *Reinforced Concrete*:—

1. In long spans the thickness of the ring can be made very much less, thus reducing the dead load and effecting a saving of 50 per cent in the cost of the ring.

2. The load being reduced, the thrust is correspondingly less, and the abutments may be made very much smaller.

3. Reinforced with steel, the working unit stresses in concrete can be considerably increased with perfect safety.

4. The danger of cracks occurring from any cause can be prevented by the proper distribution of the reinforcing metal.

5. Arch rings of such forms and proportions that the bending moments would render them impossible with any ordinary masonry can be, and have been, constructed of reinforced concrete both easily and successfully.

WATERWAY.—In arch design one of the controlling factors is the amount of waterway to be provided, and for determining this a more or less approximate survey may be made, or the area of the water-shed of the stream may be gotten by scaling a map of the region.

One of the most-used formulas for determining the area is that of Myers':—

$$\text{Area of water-way in sq. ft.} = C\sqrt{\text{drainage area in acres.}} \qquad (10)$$

where C is a variable coefficient depending on the character of ground.

Modified for the Philippines this coefficient may be taken equal to 1.5 for comparatively flat ground or slightly rolling country; for hilly ground 2.25 and for mountainous country as high as 6. These values are $1\frac{1}{2}$ the values used in the United States and should give good results.

Another formula somewhat simpler is Peck's:

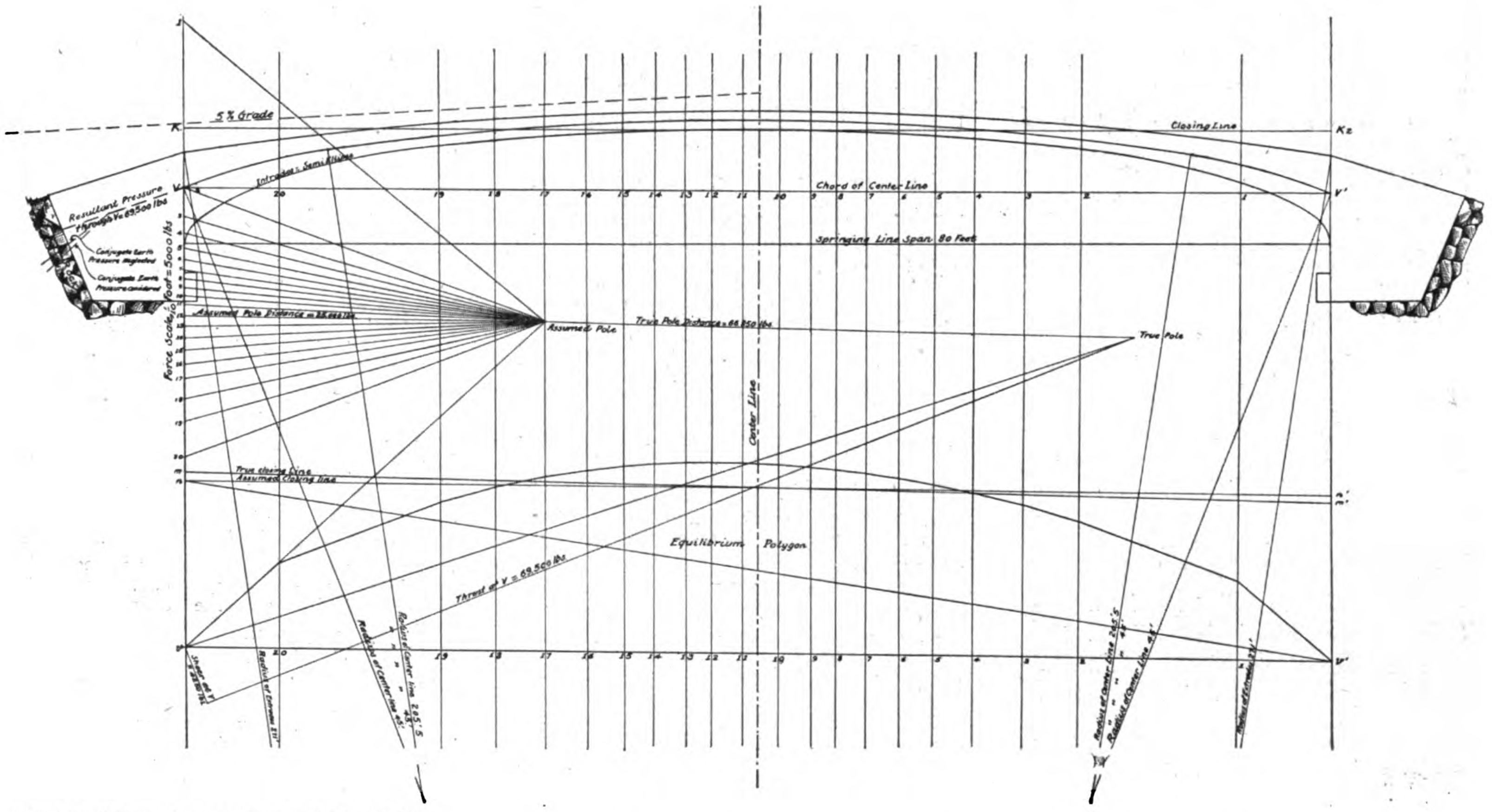
$$\text{Area of water-way in sq. ft.} = \frac{\text{Drainage area in acres.}}{C} \qquad (11)$$

In this case C varies from 2.67 to 4 depending on character of topography. These values of C are two-thirds of the values used in the United States and are thought to be adaptable for the Philippines. The smaller value of C being for mountainous country and the larger one for flat country.

SHAPE OF ARCH RING.—The rise and span of the arch being determined from a consideration of the waterway required and the grade of roadway, and possibly other local requirements, the arch-ring may be designed. The writer usually uses an elliptical intrados (or three-centered if necessary), a neutral axis approximating the parabola and a segmental or multi-centered extrados.

DESIGN.—The trial depth of the arch-ring at the crown is taken equal to 0.008 (span plus 10 times the rise), all in feet. The intrados and neutral axis are drawn to scale and the extrados is so drawn that the thickness of the arch-ring at points distant from the crown

(*Continued on page 310.*)



Reproduced from January Number of The Review.

GRAPHIC DIAGRAM OF ELASTIC METHOD FOR AN 80′ SPAN; SEMI-ELLIPTICAL INTRADOS AND THREE CENTERED NEUTRAL AXIS

THE FAR EASTERN REVIEW

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MANILA, SHANGHAI AND YOKOHAMA, MARCH 1907

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FUSHUN COAL MINES

Considering the extreme popularity of the South Manchuria Railway shares, attributable to the Fushun coal mines forming part of the company's property, a Japanese paper gives an outline of the scope and scheme of operations of these mines, according to the *North-China Daily News*. To say nothing of the total capacity of the mines, the actual output expected 18 months hence is 3,000 tons per day, which will bring in about -Y-2,000,000 giving a profit of -Y-2 a ton. The working expenses at the start will not exceed -Y-2,000,000. The transportation of 3,000 tons will require 14 trains, one train at present being limited to 38 cars; and as her freight as well as passengers must be provided for, about 20 trains in all may be considered necessary. To facilitate the running of these trains, an obvious necessity is the increase of the number of stations or extension of double tracks, while 2,400 cars and 70 locomotives for the exclusive purpose of coal-carrying will be provided. Some 272 cars and 14 locomotives are to be kept in reserve to be used for one run to and fro every four days.

A depot for the coal will be established in Tairen, which will cost -Y-1,000,000. Of the 3,000 tons daily output half is expected to be consumed by the company and the other half will be exported, so that the coal market of Japan will not be much disturbed. The shipping will be undertaken by five or six colliers for which purpose the employment of the ships captured in the late war is planned.

The 3,000 tons, again, are to be mined from within a narrow region. The existing Chienkinsai pit will have two more borings, one at Yuangpaipao, and another at Laohuai. These will yield respectively 1,500, 900 and 600 tons.

The total initial expenditure for the estimated output as given above is -Y-2,000,000. Of this sum -Y-1,001,027.50 is to be spent on shafts, rails, and other equipment. This outlay will require an annual addition of -Y-100,000 for maintenance. At present, the length of rails needed is 13 miles, and the pit and surface cars will number 2,000, to which 400 will be annually added. For this outlay -Y-28,000 will be required.

The main official personnel will number 125, inclusive of interpreters, and 200 more persons will be employed in a minor capacity. Mechanics and miners will number in all 4,146, of which 667 are to be Japanese, and the rest Chinese. The Japanese will be paid -Y-1.70 and the natives -Y-1 a day. Three hundred and sixty Japanese laborers will be employed at the outset on the same basis of pay.

A rough estimate of the accounts is also given. About -Y-6,109,180 is the expected income from 1,296,000 tons of lump coal and slag. The expenditure will be -Y-2,376,000 for working both qualities, thus giving -Y-3,733,380 on the profit side.

MANILA HEMP MARKET, 1906

Reviewing the London Manila hemp market during 1906, Messrs. Walter H. Hindley & Co., Ltd., in their annual circular say that compared with the fluctuations and vicissitudes through which this fiber has passed in the last few years, the record of the year is a relatively tame and uninteresting one. The effects of the drought and the serious typhoon which in 1905 devastated the hemp plantations in the Philippines appear to have extended over the greater part of 1906, and, in addition to these disasters, the production has been curtailed to some extent by the scarcity and dearness of money, and to some extent by the diversion of labor from the hemp industry to public works, etc. The fact remains that the receipts in the Philippine ports for 1906 show a serious deficit when compared with 1905. Commencing as 1906 did with a high level of prices ropemakers have turned their attention more than ever to the use of other fibers, and the comparative abundance of these has militated against any serious advance in values. For the first few weeks a fairly good demand prevailed, running chiefly upon the qualities under fair current, but for the next few months there was a period of comparative inertia, varied now and then with some little activity. This continued until June, when the trade, worn out in the expectation of larger supplies and a consequent lower level of prices, came into the market and bought freely, not alone for early delivery, but for shipments extending up to the end of the year, and prices of the ordinary roping kinds then touched about the highest point for the year, common sorts showing a rise since January of £3 to £4 per ton and current and finer grades about £2 per ton. Little of interest happened until August, when unexpectedly heavier receipts in the Philippines brought about some speculative selling, causing values to fall £2 to £3 per ton, but this season exhausted itself, and, the production again falling back to its previous scale, prices tended slowly upwards, and about half of the above fall was recovered. November and December, despite the growing strength of the statistical position, were disappointing months, and until quite towards the end of December values showed a slightly sagging tendency. Fine spinning qualities in 1906, as in 1905, must be treated as almost a separate fiber. Grades such as F E B showed little variation in value during the first six months, being worth £51 to £52 per ton, but during the latter half of the year a steady rise took place, and at the close this grade was quoted at £58 per ton. Some falling off in the production of these qualities was partially responsible for the rise, but the chief reason was the American demand, the bulk of the supplies of finer hemp being attracted to the United States, prices being apparently not much object with the home country when supplies are wanted.

GREAT BRITAIN'S FAR EASTERN TRADE

With regard to the statistics of Great Britain's trade with the Far East during 1906, the most noteworthy feature in the December export figures was the continued shrinkage in cotton piece goods. China's purchases dropped 20,000,000 yds., while shipments to Japan fell as much as 7,600,000 and to Netherlands India nearly 2,000,000. The returns being complete for the 12 months, it will perhaps be more interesting to compare in detail the figures for the year just closed with those of 1905. The cotton yarn and twist trade shows a decrease for China of nearly 3,000,000 lbs., though this is in part balanced by an extra 2,300,000 lbs. for Japan. The Straits supply was also slightly smaller. The trade in cotton piece goods seriously fell off last year, and particularly in the case of China, whose purchases were 150,000,000 yds. smaller in quantity. Dutch East Indies fell 20,000,000 yds., Japan 18,000,000, and the Philippines 6,000,000. The Straits only shows an increase. The linen trade with the Philippines progressed very satisfactorily, almost doubling in volume. In woollen tissues an increase of 1,000,000 yds. is recorded from Japan, and China made a slight advance; while in worsted tissues China increased 3,000,000 yds., and Japan more than 1,000,000. The metal exports, principally to the Straits and Japan, vary considerably, but there does not appear to have been much, if any, all-round increase, and several items show a considerable shrinkage. With regard to imports, the quantity of tea shipped from China again last year showed a large falling off, only 13,000,000 lbs. being imported, as compared with 15,000,000 in 1905. Silk from China also fell 85,000 lbs., while Japan's shipments slightly increased. The Java sugar supply sank to quite inconsiderable proportions, the Straits fell to half the previous year's total, and no sugar was received from the Philippines. The quantity of hemp from the Philippine Islands again fell some 9,000 tons. Tin shipments from the Straits were 2,000 tons larger than in 1905.

BRIDGING THE YALU RIVER

A Japanese authority says that the railway through Korea, from Fusan in the southeast to Wiju on the south bank of the Yalu, is approaching completion throughout its length of approximately 380 miles, and the problem of bridging the river at Wiju so as to carry forward the line to Mukden is once more attracting the attention of Japanese engineers. The present

intention is to bridge the stream some little distance below the town of Wiju, and the western end of the structure which it is proposed to erect will be situated at Shin-Wiju, on the west bank, not far from Antung, which, together with Ta-tung-kou, a few miles to the south, was recently opened to the trade of all nations under the treaties made by China with America and with Japan in October, 1903. The place at which it is proposed to provide the bridge is about five miles down stream from that which was the scene of the crossing of General Kuroki's forces on April 30th, 1904, and Shin-Wiju—that is, "New Wiju"—stands just beneath the heights which the Russian batteries occupied to the north of Antung. The length of the bridge, crossing as it will the main channel—the others are all but empty save in the rainy season—is planned to be 3,345'. Embankments will be required on either side, but the engineering difficulties are not expected to be of an extraordinary character, and are by no means insurmountable. Possibly the estimate of about $1,200,000 gold for the entire work will prove to be a sufficiently liberal one. Politically this bridging of the Yalu is not devoid of a certain degree of importance, inasmuch as Japan will be able, if necessary, to send troops as far as Mukden, at all events, without touching the Eastern Chinese Railway, which both Russia and Japan are debarred from using for the purposes of military transport, without violation of the Portsmouth Treaty, and which would constitute an act of war. On the other hand, Japan is bound not to increase her forces in Manchuria beyond a certain limited number, and were she to do so Russia would assuredly, and with justice, lodge a complaint. It is an advantage in every way, and to all, that there will presently be an alternative route to Mukden, however, and progress of this kind is to be welcomed on every side in consideration of the greater facilities that will accrue to the commerce of all nations.

CANTON-HANKOW RAILWAY, A CHINESE PUZZLE

The Hongkong correspondent of the *North-China Daily News* says it is often stated that the path of true love is beset with thorns. It may be affirmed that the building of the Canton-Hankow Railway is beset with both thorns and briars, and, that those who are interested in, and selected for, the furthering of the enterprise, are the very persons who have done much to retard its success. The present situation is characteristically Chinese, and could hardly have been created by less zigzag minds. It is confusion worse confounded. It is difficult for a foreigner, relying only on reports published in the native press, to apprehend clearly and state succinctly the situation. The Chinese mind is needed. The salient points, however, seem to have been something like this:—

When Viceroy Tsên was reigning in the Two Kuang, two Hongkong Chinese gentlemen, who, as shareholders in the railway company, had great influence, and who further had in their possession large sums of money, which Hongkong Chinese had subscribed towards the funds of the enterprise, refused to hand over the money at the central office in Canton when called upon to do so. They demanded first of all a public audit of the accounts already received, and more than insinuated that everything might not be right. As is well known Tsên was removed, and H. E. Chou Fu assumed the reins of power, and, in order that these suspicions might be verified or removed, ordered that the audit be made. It has been carried through, and as far as the public is aware, there appear to be no solid grounds for the suspicions that were aroused. When these two gentlemen declined to hand over the funds, the company naturally resented the action, and so promptly expunged their names from the list of shareholders. After the public audit had more or less testified to the straightforwardness of everything, they wished to have their names reinstated. At this the directors of the company demurred, and indeed refused point blank. But since then another difficulty has arisen, which threatens to be even more disturbing than that mentioned above. At a big meeting held in the Kuang Tsai Hospital, Canton, there was a stirring time. A certain Lao Tsz-liang charged the Canton officials with wholesale bribery. It was insinuated that in addition to the Viceroy, Yu, the Provincial Treasurer, Chu, the Provincial Judge, and Taotai Shên had all been guilty of receiving bribes at the hands of the directors of the railway company. The meeting was supposed to be in camera, but somehow a report of the meeting found its way into the pages of *The Political News;* one of the Canton dailies. Of course there was a tremendous outburst of anger, on the part of the officials, whose honesty had been impugned, and a troop of soldiers was at once ordered to the room of the editor who, under safe escort, was compelled to pay a visit to the magistrate's yamên. Here in self-defence he made a clean breast of his part in the transaction, and so the author of the aspersions, Lao Tsz-liang, was arrested, and is now in custody. The officials, it is reported, are furious and consumed by a white-hot rage. They have determined that he shall continue in durance vile until he can produce the very witness who actually saw bribes paid over into the hands of the officials. Further, an attempt has been made to confuse the issue, by insinuating that the secret meeting held in the Kuang Tsai Hospital was sanctioned by the general body of shareholders and directors, whose official representatives in Canton are the Seventy-Two Hongs. The latter have angrily repudiated this sanction. The Seventy-Two Hongs have not only done this, but they have taken vigorous steps to prevent the reinstallation of the two Hongkong Chinese, whose action first of all started the trouble among the shareholders. A few days ago arrangements were made whereby the public proclamation, posted upon the walls of their office, might be photographed just as it was published. The public proclamation denounced the insinuations of the two Hongkong Chinese, and, at the same time, stated in unmistakeable language, that the two agitators should not be reinstated in their old position. All this has been photographed piece by piece, and after the several sections have been arranged, so as to form one complete whole, the proclamation will be forwarded by the imperial post to Peking, for the information of the several boards which are supposed to be interested in the construction of the railway and also have authority vested in them to direct more or less effectively the course of events. Meanwhile ex-Viceroy Tsên has just sent down a long telegram from Shanghai, in which he has advised patience, and deprecates anything like summary and unpremeditated action, either on the part of the officials or the shareholders.

It is easily seen from this brief summary of the reported situation, that affairs have become as inextricably involved, as rings in the hands of a clever conjurer. They can only be separated by the same minds that have produced the confusion. It is often asserted that where there is smoke there must be fire: it is certain that where there is smoke there may be fire, and no one can deny that there is a considerable volume of smoke here. Chan Kang-yu, and his companion Yung, whose action in refusing to hand over the funds led to all that has followed, are by no means without influence among the Chinese in Hongkong and are unlikely to have taken the determined stand without some solid ground for their suspicions and action. At first, when the Viceroy ordered that a public audit be made, some of the directors were reported to be averse thereto and this aversion was animadverted upon in the Chinese press. The more difficult matter to straighten out is the charge of peculation made against the provincial officials *en masse*. Lao Tsz-liang should have had indubitable evidence of such bribery, or he should have kept his mouth closed. He apparently had forgotten that what is spoken in secret in China to-day, as in more favored lands, may to-morrow be proclaimed upon the housetop, and therefore should have been less generous in his insinuations.

Peculation and squeezing amongst Chinese officials are not unknown to the initiated, but the day is dawning when those who are guilty of such shady transactions may read a report thereof and a criticism thereon at their early meal on the following morning. A few years ago when there were no newspapers, such beings were known only to the few, and no one was greatly disturbed, because, probably, all to whom the facts were known, had been, at one time or another, tarred with the same brush. It is not so to-day. What is greatly to be regretted is that the affair should have become entangled into this confusion, when facts call loudly for a straightforward course. When a great enterprise like this is to be put through, confidence in the reliability of the directors should not be undermined; absolute faith in the integrity of the leaders is a *sine qua non* of success. At this juncture when China is making such frantic efforts in so many ways to arrange her affairs so that she may hold up her head among the nations and would regard herself as moving in line with Japan, in the forefront of civilization, an exhibition of this kind, with or without foundation, is much to be deplored, for mud cannot be thrown without either the thrower, or those at whom it is thrown being smirched thereby. Mud-throwing, moreover, is not an occupation that should be indulged in by men whose ambition should be to push forward a great enterprise, but by foolish boys, who are either angry with each other, or captivated by love of a pastime, which is somewhat ignoble.

THE EASTERN MINING COMPANY

It is gratifying to such as have the best interests of the Islands at heart, to see efforts being made toward actual development, and especially so in the field of our rich mineral deposits.

We refer particularly to the establishment of a New York office by A. M. Heise, the President of the Eastern Mining Company and his work in securing the necessary additional capital for the enlargement of its output. The goldfields of Masbate have passed the days of prospect, and the numerous claims, and several companies actually at work attest the value of the field. Only capital is needed for profitable development, and it is not to be found in Manila.

The Eastern Mining Company received its first impulse and financial support from the slender capital available in Manila and it speaks volumes for the confidence reposed in the enterprise when it is known that the list of stockholders contains the names of many of the most prominent men in the Islands. An amount approximating $100,000, all subscribed for in the Philippines, has been spent in developing the properties, which embrace some 16 quartz claims, all demonstrated, and 30 river placer claims

The Company has had a 5 stamp mill in operation for the last two years and the development now warrants the construction and installation of a larger plant. There is sufficient ore to supply a very large plant so it has been concluded to erect a 40 stamp mill capable of treating 200 tons of ore per day. With the labor cost of 36 cents per day, and food the cost of milling should not exceed $2.00 per ton.

The Company is selling just enough stock to pay for this equipment which will approximate $125,000 and a large proportion has already been placed.

However, it is a long way from Masbate to Manila, and from Manila to Wall Street and with the present boom in Nevada gold mining stocks it is not an easy matter to interest investors.

The Review is not an agent for stock jobbing Companies and will not knowingly commit itself to the indorsement of every scheme originating in the Islands, but knowing as we do of the high character and standing of the prime movers in this concern and from official assays and reports on the mines we have no hesitation in giving the enterprise our cordial support and indorsement.

FOREIGNERS IN CHINA

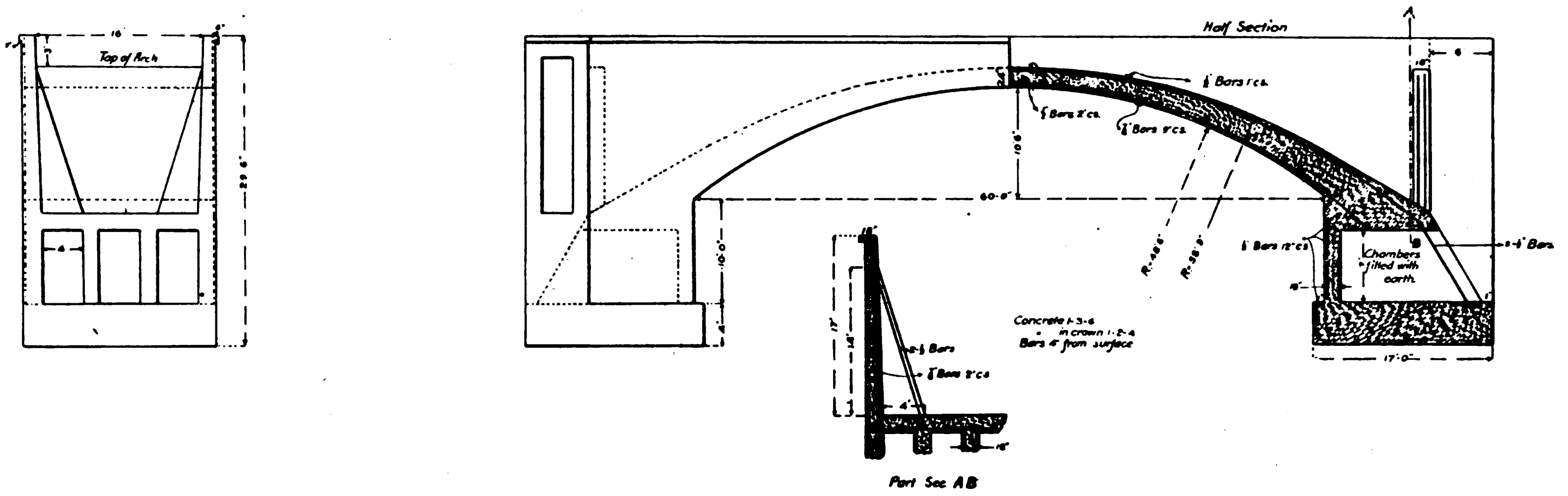
The foreign population in China in 1906 is estimated by Mr. Thomas Sammons, American Consul-General at Newchwang, at 46,000. This includes 6,454 at Hongkong (British territory), 1,432 at Tsingtao (German), and 7,698 at Newchwang, but does not include the balance of Manchuria and Mongolia By figuring 20,000 to 30,000 Japanese, aside from railway guards, in Southern Manchuria, and as many Russians in the north and Mongolia, the grand total would be over 100,000 foreigners. It is estimated that less than 8,000,000 Chinese are living outside of their native land, 75 per cent of whom are accounted for in Formosa, Siam and the Malay Peninsula.

PRACTICAL DESIGN OF ARCHES AND NOTES ON REINFORCED CONCRETE CONSTRUCTION

(Continued from page 307.)

¼ the entire span is 1.25 crown thickness. Then the principles of the elastic theory are applied. The accuracy of this method of treatment has been demonstrated conclusively in arches of almost every size in reinforced concrete. In fact this method is the only exact means of determining the stresses in an arch-ring of any shape and cross section that is fixed at the haunches. This method is also applicable to hinged arches as well, and to any arch of homogeneous material or homogeneous combination of materials that is continuous throughout the entire span. The method consists in determining the true equilibrium polygon for the given arch and its location in the arch ring.

—The following conditions must be fulfilled in a fixed arch for the application of this method:—(1) the tangents to the neutral line at the



STANDARD DESIGN OF REINFORCED CONCRETE ARCH IN THE PHILIPPINE ISLANDS

springing are fixed in direction, (2) the span is fixed; (3) the vertical deflection of one springing with reference to the other is zero.

Mathematically these conditions for an arch of homogeneous material are expressed as follows:—

$$\Sigma \frac{Ms}{EI} = 0$$

$$\Sigma \frac{Mys}{EI} = 0$$

$$\Sigma \frac{Mxs}{EI} = 0$$

In the above s is the length of a short segment of the ring measured on the neutral axis, and x and y are the abscissa and ordinate of the center of s with respect to one of the springings of the neutral axis.

In a reinforced concrete arch these equations would take the following form:

$$\Sigma \frac{Ms}{Ec\ Ic + Es\ Is} = 0$$

$$\Sigma \frac{Mys}{Ec\ Ic + Es\ Is} = 0$$

$$\Sigma \frac{Mxs}{Ec\ Ic + Es\ Is} = 0$$

Let T = the horizontal thrust, which is constant throughout the ring for any one series of loads.

" i = the intercept measured vertically between the neutral axis and the line of pressure.

" M = bending moment at any given point.

Then M = T i.

If s ÷ (Ec Ic + Es Is) is made a constant by careful subdivision of the arch ring the term T s ÷ (Ec Ic + Es Is) may be placed outside the summation sign, giving the simple equations for the elastic arch:—

Σ i = 0. (12)

Σ iy = 0. (13)

Σ ix = 0. (14)

In order to divide the neutral axis into such segments as will make s ÷ (Ec Ic + Es Is) a constant, it will be necessary to assume that throughout the entire arch ring the values of Is ÷ Ic are constant. This involves no appreciable error in the results and simplifies the work. On this assumption s ÷ Ic is made constant throughout the arch ring. Since Ic varies as the cube of the depth of the section we may satisfy the condition by making $s \div h^3$ a constant.

In this expression s is taken as the length of any segment measured on the neutral axis, and h, the corresponding radial depth of ring at the middle of the segment. When the neutral axis is so divided that $s \div h^3$ is a constant, the simple formulas (12), (13) and (14) may be used.

The ring would theoretically be divided up into an infinite number of segments, s being infinitely small. But in practical graphics it is not possible to deal with infinitesimals, so it is usually divided into 10, 20 or 30 segments. The larger the number of segments the ring is divided into the more exact the location of the equilibrium curve or true pressure line in the arch.

GRAPHICAL TREATMENT.—The graphical method to be given is that of Professor Eddy, with some modifications in analysis based on Church's treatment of the elastic arch.

In *Fig. 4* let vLv' represent a curve (or equilibrium polygon composed of a series of straight lines) through which we desire to draw a closing line nn' in such a manner as to have the area above nn' and included between it and the curve equal to the similar area below nn'. (Let the area above nn' be considered positive and below it negative.) In other words it is required to draw nn' in such a manner as to make the area ALB equal to the sum of the areas nAv and n'Bv'. If the intercepts between n'n and vLv' are i, when these areas are equal, Σi = 0. Any number of positions of nn' will satisfy this condition.

To make Σix = 0. This imposes the further condition that the centre of gravity of the positive area must lie in the same vertical line as the centre of gravity of the negative areas taken together.

No change in the centres of gravity of the positive and negative areas will be produced by adding to each the area vABv'. Suppose this to be done in *Fig. 5*, being indicated by the shaded areas. Then the conditions become (1) the area of the figure vALBv' must equal the sum of the areas of the two triangles vv'n and v'nn', and (2) that the centres of gravity of the positive and negative areas must coincide. If we consider the sum of the positive areas as a weight R resting on a horizontal beam, then T and T' would represent the reactions at the supports of the beam. Divide the curvilinear figure vALBv' into vertical strips and find the area of this figure. Then compute its centre of gravity. Compute also the centres of gravity of the triangular figures vnv' and nv'n' represented by T' and T, respectively. If the centre of gravity of T and T' taken together coincides with the centre of gravity of the curvilinear figure the two conditions (Σi = 0. Σix = 0) are satisfied, and T: T': r'f: rf. (A) If these centres of gravity do not coincide the values of vn and v'n' must be altered until this condition is satisfied. This change may be computed from the evident relation shown in *Fig. 5*,

T:T':: vn:v'n' (B)

Also, since the values of T and T' have to be altered so that the centre of gravity of the two taken together shall coincide with the centre of gravity of R, we have the new relations,

T'': T''':: vm: v'm' T'': T''':: r'f: rf (C)

in which T'' and T''' represent the new values of T and T', respectively, and vm and v'm' the new ordinates to satisfy the condition above stated.

The value of R is always equal to the sum of T and T'. Since the triangles (T and T') have equal altitudes, equal to the span, the sum of their areas will be a constant if the sum of the end-ordinates vm and v'm' is equal to the sum of vn and v'n'. From (A), (B) and (C) we derive the relation.

vm : v'm' :: r'f : rf

When this condition is true equations (12) and (13) are satisfied.

To satisfy the third condition, Σ iy = o. In *Fig. 6* let vPv' represent the neutral axis of any arch, vv' being the springings of the neutral axis at the abutments. Suppose that v'KK'K''v represents the equilibrium polygon for the loads W'W''W'''. Suppose that the closing line mm' of the equilibrium polygon satisfies equations (12), (13) and (14). Let all ordinates of the equilibrium polygon and all ordinates of the neutral axis of the arch be measured from mm' as a reference line, distances above mm' being positive and below, negative. At any given point in the neutral axis, a, whose coördinates are x, y, let i be the vertical intercept between the neutral axis and the equilibrium polygon. Let i' = the distance from mm' to a measured vertically. Also let i'' = the distance (or ordinate) from mm' to the equilibrium polygon. Then iy = (i'—i'') y. Reference to *Fig. 6* will show that the same relation will apply to all other points of the arch. This being true, Σ iy = Σ i'y— Σ i''y. Since Σ iy must equal zero for the true equilibrium polygon, Σ iy will become zero only when Σ i'y is equal to Σ i''y.

The ordinates of any equilibrium polygon vary inversely as the pole-distance. Hence any change in the pole-distance will produce inverse, but proportional, changes in the lengths of the ordinates of the equilibrium polygon. For this reason, if any pole-distance is assumed for the construction of an equilibrium polygon, and equations (12) and (13) are satisfied, changes in the value of the pole-distance will not affect the values of Σ i = 0 and Σ ix = 0.

TABLE I.—ADJUSTMENT OF $S+h^3$.

Point	First Trial				Second Trial				Third Trial				Fourth Trial *				Sum of Distances.
	h	h^3	S	$S+h^3$	h	h^3	S	$S+h^2$	h	h^3	S	$S+h^2$	h	h^3	S	$S+h^3$	
1	3.50	42.875	7	0.164	3.50	42.875	23.30	0.493	2.10	9.260	12.14	1.368	2.60	17.576	16.10		16.10
2	2.40	13.824	6	0.434	2.40	13.824	6.82	"	1.45	3.048	4.18	"	1.75	5.359	4.90		21.00
3	1.90	6.859	5	0.730	1.90	6.859	3.38	"	1.35	2.460	3.37	"	1.60	4.096	3.75		24.75
4	1.70	4.913	4.5	0.917	1.70	4.913	2.42	"	1.30	2.197	3.08	"	1.48	3.241	2.96		27.71
5	1.45	3.048	4.0	1.32	1.45	3.048	1.52	"	1.30	2.197	3.08	"	1.45	3.049	2.79		30.50
6	1.40	2.744	3.5	1.27	1.40	2.744	1.35	"	1.30	2.197	3.08	"	1.37	2.571	2.35		32.85
7	1.30	2.197	3.25	1.53	1.30	2.197	1.08	"	1.30	2.197	3.08	"	1.35	2.460	2.25		35.10
8	1.30	2.197	3.0	1.37	1.30	2.197	1.08	"	1.30	2.197	3.08	"	1.30	2.197	2.01		37.11
9	1.27	2.048	2.5	1.61	1.27	2.048	1.02	"	1.28	2.097	2.88	"	1.27	2.048	1.87		38.98
10	1.25	1.953	2.0	1.03	1.25	1.953	6.96	"	1.25	1.953	2.68	"	1.25	1.953	1.77		40.75
		82.658	40.75				42.93			29.803	40.75	1.368		44.550	40.75	.915	

*Approximately Correct.

In First Trial "S" is assumed so that $\Sigma s = 40.75$ and the average thickness of each section of ring is scaled off from plan.
In second Trial "h"s remain same as in first Trial and "s" are calculated so that $s \div h^3$ is constant. The h's are always scaled from drawing.

But all the ordinates of the equilibrium polygon will be altered in value inversely as the change in the pole-distance. The position of mm′ is determined, as shown, by making it satisfy the conditions $\Sigma\ i = 0$ and $\Sigma\ ix = 0$. Changes in the pole-distance do not change the position of mm′. $\Sigma\ i'y$ can be determined after mm′ has been located, by adding together all the products of each intercept, i′, by its corresponding ordinate, y, of the neutral axis. In a similar manner $\Sigma\ i''y$ is determined. If $\Sigma\ i'y$ is equal to $\Sigma\ i''y$ the value of $\Sigma\ iy$ will be equal to zero, thus satisfying equation (14). If i′y is *not* equal to i″y, the values of i″ must be multiplied by the ratio $\Sigma\ i'y \div \Sigma\ i''y$. This may be done by changing the pole-distance in the inverse ratio, that is, by multiplying the assumed pole-distance by $\Sigma\ i''y \div \Sigma\ i'y$. If this is done the new intercepts, i″, will reduce the value of Σ iy to zero.

This true pole-distance is also equal to the thrust at the crown of the arch and in a direction parallel to mm′.

Thus it is seen that practically the whole problem of the elastic arch is the determination of the closing line of the equilibrium polygon that will satisfy equations (12), (13) and (14).

After the true pole-distance is found the true line of pressure in the arch may be drawn by laying off to scale the values of i at the various points of the arch, measuring from the neutral axis. Positive values of i will be plotted above the neutral axis and negative values, below it. The lines joining these points successively is the true line of pressure of the arch.

The pressure in the arch at the various sections will be readily found by drawing the rays of the true equilibrium polygon, and scaling their values directly. At any section, if the line of pressure does not pass through the neutral axis at that section and tangent to the neutral axis of the section, the resultant force will produce a direct thrust, a bending-moment and a shear at that section. The bending-moment at any section may be found by multiplying the intercept i by the pole-distance. To find the direct thrust and shear at the given section resolve the resultant force acting at the section into components tangent and perpendicular to the direction of the neutral axis at the given section. The resolved force parallel to the tangent through the neutral axis will be the direct thrust at the section, and the other component will be the shear at the section.

To illustrate the graphic treatment an example in arch design will be given as actually worked out by the writer.

EXAMPLE.—Design on arch of 80′ clear span, rise 8′, for a live load of 100 lbs. per square foot, assuming a gravel roadway on top 12″ thick, and spandrel fill of earth below the gravel surface. The grade of roadway is to be 5 per cent on both spandrels. Concrete to be 1 : 2 : 4 and calculated for a maximum compressive stress of 400 and maximum tensile stress of 40 lbs. per square inch. The abutments will rest on rock foundation.

The semi-ellipse is first drawn with axes of 16′ and 80′. Computing crown thickness by the formula given under the head of design, we have crown thickness = 0.008 [80 + 10 (8)] = 1.28′ approximately. Lay off 0.64′ above crown of semi-ellipse and thus locate the crown point of the neutral axis. At the quarter points (20′ horizontally each way from the crown point) lay off radially above the intrados distances equal to 1.25 crown thickness. The crown point of the extrados is found by laying 1.28′ off above the crown of the intrados. Through the three points of the extrados thus located pass an arc of a circle, prolonging it to intersection with the verticals through the abutment faces.

The neutral axis is then drawn midway between the intrados and extrados. A 3-centered curve approximating a parabola is usually sufficiently accurate.

The length of the neutral axis is found to be 81.50′. The arch ring is then divided into 20 segments "s" in such a manner as to make $s \div h^3$ constant for all the segments. The manner of determining these segments is shown in *Table I*. This is a *cut-and-try* method but usually only a few trials are necessary to properly subdivide the ring. These subdivisions are then laid off on the neutral axis and verticals are passed through these points of division. (These verticals are not shown in the diagram.)

The loads directly over each of the segments are computed from the data given and placed in *Table II*. In order to secure maximum stresses in the arch ring the live load is considered to extend over one-half of the arch. (In most cases this will give maximum stresses, though in special cases there may be a small error in this assumption). A summation of loads is made in *Table II* for the purpose of plotting them on the load line.

Verticals are then drawn through the centers of gravity of the combined loads on each segment. These are numbered from 1 to 20. The weights are all taken for an arch ring one foot wide.

Assuming a pole-distance of 25,000 lbs. and a suitable force scale draw the trial equilibrium polygon in the usual manner, as shown.

Draw a line joining V and V′, the springings of the neutral axis.

To make $\Sigma\ i = 0$ is to make the algebraic sum of all the ordinates between the ***equilibrium*** polygon and the neutral axis equal to zero. Distances above the neutral axis are considered positive and below, negative.

The pole-distance being assumed, the trial equilibrium polygon does ***not*** give the true line of pressure. But after equations 12 and 13 have been satisfied in the trial polygon the exact ratio between the assumed pole-distance and the true pole-distance is readily determined and equation 14 may be satisfied. Now measure the ordinates on verticals 1-20 from V V′ to the neutral axis and place these values in column 2 of *Table III*. In column 3 place the scaled intercepts of the equilibrium polygon included between the closing string v v′ and the upper boundary of the equilibrium polygon. Assuming V′ as the origin, scale the distances to the lines 1-20 and place these values in column 4. These distances are the lever arms of the various ordinates measured on verticals 1-20. These horizontal distances represent the x's of the various points of the neutral axis.

To make $\Sigma i = 0$.

Draw K, K2 at a distance from VV′ equal to the mean of all the ordinates between V′V and the neutral axis. This distance is 84.66 ÷ 20 = 4.233′.

A trial closing line nn′ for the equilibrium polygon is drawn in a similar manner by making vn and v′n′ equal to the mean of the ordinates of the equilibrium polygon.

At any point i is equal to the difference between the ordinate of the neutral axis at that point and the corresponding ordinate of the equilibrium polygon. The algebraic sum of all the ordinates of the neutral axis measured from K, K2 is zero. Also the algebraic sum

TABLE II.—LOADS.

Points 1-10 from Rt. Haunch to centre.
Points 20-10 from Lt. Haunch to centre.

Points.	1	2	3	4	5	6	7	8	9	0
Wt. of Ring	7095	1170	616	626	500	480	400	385	375	405
Wt. of Spand	2900	330	235	110	—	—	—	—	—	—
Gravel Surface	1610	490	375	296	279	235	225	201	187	177
Total Loads	11605	1990	1225	1032	779	715	625	586	562	582
Summation	11605	13595	14820	15852	16631	17346	17971	18557	19119	19701

Points.	20	19	18	17	16	15	14	13	12	11
Wt. of Ring	7095	1170	615	626	500	480	400	385	375	405
Wt. of Spand	2900	330	235	110	—	—	—	—	—	—
Wt. Gravel Surface	1610	490	375	296	279	235	225	201	187	177
Total Loads	11605	1990	1225	1032	779	715	625	586	562	582
Live Load	1610	490	375	296	279	235	225	201	187	177
Total Loads	13215	2480	1600	1328	1058	950	850	787	749	759
Summation	23776	10561	8081	6481	5153	4095	3145	2295	1508	759

TABLE III.—(Section 1′ wide)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Points	Ordinates Arch	Equilibrium Polygon			Triangles		Ordinates for Closing Line		Products i′y Col 8× Col 2	Products i″y Col 9× Col 2	True Ordinates Equilibrium Polygon Co. 8× 14.32/36.70	Meas. of Moments Diff. Col. 12 Col. 9	Moments Foot lbs. Col. 13× 64,000	Thrusts from Drawing.
		Ordinates	Lever Arms	Moments	Ordinates	Moments	mpm′	K′ a K″	Arch	Equil. Poly.				
							(−11.05)	(−4.233)			(−4.37)	(−0.14)	− 8,980	66,500
V′	2.00	5.50	6.60	36.30	0.96	6.27	−5.40	−2.39	−4.78	−10.80	−2.11	+0.28	+17,960	66,000
1	3.60	9.55	17.70	169.00	2.56	45.20	−1.71	−0.37	−1.33	−6.14	−0.67	−0.30	−19,200	65,500
2	3.95	10.60	21.60	228.96	3.25	70.00	−0.71	−0.17	−0.67	−2.80	−0.28	−0.11	− 7,040	65,000
3	4.30	11.38	24.50	278.80	3.54	86.70	+0.05	+0.11	+0.47	+0.22	+0.02	−0.09	− 5,760	64,600
4	4.55	11.90	27.80	330.82	4.02	111.50	+0.50	+0.27	+1.23	+2.28	+0.20	−0.07	− 4,480	64,250
5	4.65	12.35	30.35	374.82	4.40	133.00	+0.90	+0.39	+1.81	+4.18	+0.35	−0.04	− 2,560	64,100
6	4.75	12.60	32.60	410.80	4.70	152.60	+1.20	+0.44	+2.09	+5.69	+0.47	+0.03	+ 1,920	64,100
7	4.80	12.85	34.70	446.00	4.99	173.20	+1.36	+0.55	+2.64	+6.53	+0.53	−0.02	− 1,280	64,100
8	4.85	13.00	36.50	474.50	5.28	192.00	+1.50	+0.57	+2.77	+7.27	+0.59	+0.02	+ 1,280	64,050
9	4.88	13.15	38.65	508.70	5.58	215.00	+1.60	+0.60	+2.93	+7.82	+0.63	+0.03	+ 1,920	64,000
10	4.88	13.25	41.20	547.00	5.95	215.00	+1.69	+0.60	+2.93	+8.27	+0.66	+0.06	+ 3,840	64,000
11	4.85	13.25	43.40	575.00	6.25	271.00	+1.66	+0.57	+2.77	+8.04	+0.65	+0.08	+ 5,120	64,100
12	4.80	13.25	45.25	600.00	6.52	294.50	+1.61	+0.55	+2.64	+7.73	+0.63	+0.08	+ 5,120	64,150
13	4.75	13.15	47.30	622.00	6.82	322.00	+1.46	+0.44	+2.09	+6.94	+0.56	+0.12	+ 7,680	64,200
14	4.65	12.95	49.65	643.00	7.15	354.50	+1.25	+0.39	+1.81	+5.81	+0.49	+0.10	+ 6,400	64,450
15	4.55	12.60	52.15	657.00	7.52	391.70	+0.86	+0.27	+1.23	+3.92	+0.34	+0.07	+ 4,480	64,600
16	4.30	12.10	55.10	667.00	7.93	437.00	+0.35	+0.11	+0.47	+1.51	+0.14	+0.03	+ 1,920	65,000
17	3.95	11.35	58.50	664.00	8.44	493.00	−0.44	−0.17	−0.67	−1.74	−0.17	0.00	—	65,300
18	3.60	10.35	62.40	646.00	8.99	560.70	−1.60	−0.37	−1.33	−5.77	−0.63	−0.07	− 4,480	65,600
19	2.00	5.90	73.50	434.60	10.66	783.00	−6.13	−2.39	−4.78	−12.26	−2.40	−0.01	− 640	66,000
20							(−12.05)	(−4.233)			(−4.68)	(−0.45)	−28,800	66,500
Sums	84.66	231.03		9304.30	115.52	5337.87	+ = −	+ = −			+ = −			
	Quantities in parenthesis not to be added.						±14.72	±2.93	±14.32	±36.70	±6.26			

of the ordinates of the equilibrium polygon measured from nn′ is zero.

Σi=Σ ordinates of neutral axis—
Σ ordinates equilibrium polygon.

As the algebraic sum of each set of ordinates is zero, their difference is zero, So Σi becomes equal to zero when nn′ and K, K2 are drawn as indicated above.

It is now required to make Σix=0. Draw the diagonal nv′ dividing nvv′n′ into two triangles. Scale all the ordinates of the triangle vv′n measured on the lines 1-20. Place these values in column 6 of *Table III.* Since the triangles vv′n and nv′n′ are equal their centers of gravity will be equidistant from a vertical line through the center of the arch. To find center of gravity of triangle nvv′, multiply each ordinate of column 6 by its lever arm in column 4, place these moments in column 7; divide the sum of the moments in column 7 by the sum of the ordinates, column 6. This is 5337.87÷115.52=46.20 feet from v′ or 6.20′ to the left of the centre line. The centre of gravity of the intercepts of the triangle nvv′ is 6.20′ to the right of the centre line.

In a similar manner the centre of gravity of the ordinates of the equilibrium polygon is found. Multiply ordinates in column 3 by the corresponding lever arms in column 4, placing the results in column 5. The centre of gravity of the equilibrium polygon is 9304.30÷231.03=40.27′ from v′. This is 0.27′ to the left of the centre of the arch.

To satisfy Σi x=0, the centre of gravity of the two triangles must coincide with the centre of gravity of the equilibrium polygon.

From the discussion that preceded this example it was shown that the area, or sum of ordinates of each of the triangles was proportional to the end ordinates vn and v′n′. So without increasing the total area of the two triangles the ordinates, vn and v′n′, are altered so that the centre of gravity of the two triangles together will coincide with the centre of gravity of the equilibrium polygon.

Referring to *Fig. 5* T and T′ represent the value of the sum of the ordinates of the triangles nvv′ and nv′n′, each equal to 115.52. R represents the sum of the ordinates of the equilibrium polygon, equal to 231.03.

Now the distance from R to T′ is equal to 6.20—0.27=5.93 and the distance from R to T is 6.20+0.27=6.47.

For the centre of gravity of the two triangles to coincide with the centre of gravity of the equilibrium polygon new values of T and T′, represented by T″ and T‴, respectively, must be found.

These values will be proportional to 5.93 and 6.47. To do this divide the sum of the trial end ordinates vn+v′n′ into parts proportional to 5.93 and 6.47.

vn+v′n′=23.10

$$vm=\frac{6.47}{12.40}23.10=12.05$$

$$v'm'=\frac{5.93}{12.40}23.10=11.05$$

Lay off vm=12.05′, and v′m′=11.05′ on the diagram, and draw the new closing line mm′.

Measure the ordinates included between closing line mm′ and the equilibrium polygon and place these in column 8. The distances above mm′ are considered positive and below, negative.

In the same manner scale the ordinates included between K, K2 and the neutral axis of the arch. Place these values in column 9. The sum of the positive values in column 8 equals the sum of the negative values. In the same manner the positive and negative values of column 9 are equal, thus satisfying the equation Σ i x=0.

To make Σ i y=0. From the theoretical discussion it was shown that this condition would be satisfied by making Σ y times the ordinates of arch= Σ y times ordinates of equilibrium polygon. The ordinates are measured from K, K2 and mm′ respectively.

In column 10 place the products of arch ordinates (column 9) and the corresponding y-ordinates (column 2). In column 11 place the products of equilibrium ordinates (column 8) and the corresponding y-ordinates (column 2).

The sum of the arch products is +14.32 and of the equilibrium products is +36.70.

In order to make these equal multiply column 8 by $\frac{14.32}{36.70}$ and place the corresponding products in column 12. The values given in column 12 are the intercepts of the true equilibrium polygon. The pole distance of the true equilibrium polygon is 64,000 lbs., found by multiplying 25,000 by $\frac{36.70}{14.32}$. The measure of bending moments at the various sections will be the difference between the values of the intercepts of the arch closing line and the equilibrium closing line. These differences are found by subtracting the values in column 9 from the corresponding values in column 12. The results are placed in column 13. The bending moments in foot-pounds are gotten by multiplying the values in column 13 by 64,000. This is based on the principle that the bending moment at a given section for any loading is equal to the product of the assumed pole-distance of the equilibrium polygon and the ordinate of the equilibrium polygon at that section.

The true line of pressure in the arch is readily constructed by laying off to scale the intercepts given in column 13, plus distances being measured above, and minus distances below the neutral axis of the arch ring. The series of lines joining these points will be the true pressure line of the arch.

Through the assumed pole draw a line parallel to mm′. On this measure off horizontally a distance of 64,000 lbs. from the load line. The point found will be the true pole. Rays drawn from this point will give the directions of the strings of the equilibrium polygon. Each of

these can also be resolved into components perpendicular to the section and perpendicular to the neutral axis at corresponding parts of the arch. These components may be scaled and will give the direct thrust and shear, respectively at each section.

Column 15 gives the values of the thrusts at the various sections. found by resolving the rays of the equilibrium polygon into rectangular components as just indicated.

NOTATION.—The following notation will be used throughout in this discussion:—

Let Q = thrust in lbs. on a slice of the arch ring one inch thick.

M = bending moment in inch.-lbs. on a slice one inch thick.

h = thickness of concrete in inches at any given section.

d = distance center to center of bars in the same vertical plane.

Is = Moment of inertia of steel for one inch slice.

Ic = moment of inertia of concrete for one inch slice.

Ss = Resisting moment of steel for one inch slice.

$$Ss = Is + \frac{d}{2}$$

fs = maximum stress per sq. in. in steel.

fc = maximum stress per sq. in. in concrete.

Es and Ec = moduli of elasticity of steel and concrete, respectively.

As = Area of steel in sq. in. per inch slice.

a and b = the part of entire load carried by the concrete and by the steel respectively.

W = total load.

Wc = load carried by concrete.

Ws = load carried by steel.

If the elastic limit of the concrete is not to be exceeded we have

$$\frac{Wc}{Ws} = \frac{Ec\ Ic}{Es\ Is} = M \qquad (15)$$

$$a = \frac{m}{1+m} \qquad (16)$$

$$b = \frac{1}{1+m} \qquad (17)$$

Then from mechanics we have

$$fc = a\left(\frac{Q}{h} \pm 6\frac{M}{h^2}\right) \qquad (18)$$

$$fs = b\left(\frac{Q}{As} \pm \frac{M}{Ss}\right) \qquad (19)$$

Formulas 18 and 19 give the maximum stresses in the steel and concrete when the stresses at any given section are known.

In formulas 18 and 19 a positive sign always signifies compression and a negative sign.

It will be seen that the pressure line passes within the middle third of the arch ring at every point, which should be the case in every properly designed arch whether reinforced or not.

The method of proportioning the steel for reinforcing at the various sections will be given, the same method being used throughout to compute the maximum stresses at the critical sections. If the critical sections are so proportioned that the maximum safe working stresses in the materials are not exceeded all other sections of the arch ring will be sufficiently strong to carry the loads imposed upon them.

Let us consider the crown section to see if it is thick enough to resist crushing. The total thrust on the crown section for an inch width is 5,330 lbs. and the area of the crown section is 15 sq. ins. This gives a stress of 356 lbs. per sq. in. which is safe.

The first section to be considered in proportioning the amount of steel reinforcing to use will be section 11. For a trial let it be assumed that the distance from the centre of the reinforcement to the outer edge of the concrete is to be 2″. The bars will be symmetrically placed with respect to the neutral axis. Assume a value of $Es \div Ec = 15$, which is a safe value to use for 1-2-4 concrete.

Referring to *Table IV*, we find

$Q = 5330$ lbs.; $M = 3840$ in.-lbs. $h = 15$ in.

Also, $d = 11$ in. from the assumed spacing of the bars. Try a reinforcement of steel equal to 0.75 per cent of the area of the concrete. Then we have

$As = 0.1125$ sq. in.

$Is = (5.5)^2 \times 0.1125 = 3.40$

$Ss = 3.40 + 5.5 = 0.619$

$$Ic = \frac{15^3}{12} = 281.25$$

$$\frac{Wc}{Ws} = \frac{Ec\ Ic}{Es\ Is} = \frac{281.25}{15(3.40)} = 5.51 = m \text{ (Equation 15)}$$

From equations 16 and 17

$$a = \frac{5.51}{1\ 5.51} = 0.85$$

$$b = \frac{1}{1\ 5.51} = 0.15$$

Fig. 4

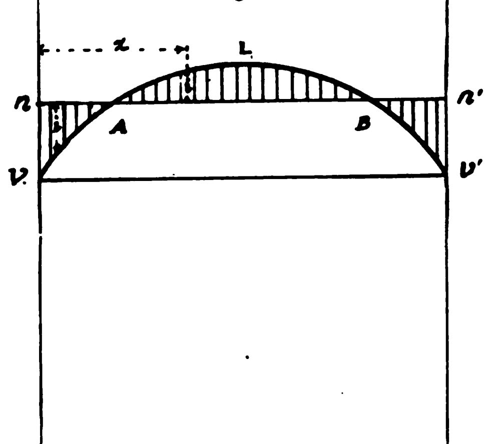
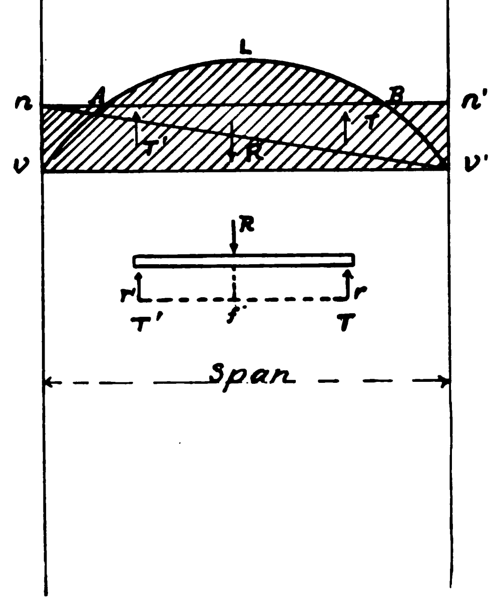


Fig. 5



Substitute the above values in equations 18 and 19

$$fc = 0.85\left\{\frac{5330}{15} \pm \frac{6\ (3840)}{225}\right\}$$

$$= \left\{\begin{matrix}389 \text{ lbs. per sq. in.} \\ 217 \text{ lbs. per sq. in.}\end{matrix}\right\}$$

$$fs = 0.15 = \left\{\frac{5330}{0.1125} \pm \frac{3840}{0.619}\right\}$$

$$= \left\{\begin{matrix}(8043 \text{ lbs. per sq. in.} \\ (6180 \text{ lbs. per sq. in.}\end{matrix}\right\}$$

It will be seen that the allowable stresses in both materials are not exceeded and that the stress in the concrete is very near the full safe working strength. No appreciable reduction in the area of steel used can be made without increasing the stress in the concrete beyond the safe allowable stress.

In like manner let us examine section 12.

$Q = 5340$ lbs. $\qquad M = 5120$ in.-lbs.
$h = 15.3$ in. $\qquad d = 11.3$ in.

Since the same bars will be used throughout the arch ring we have as before, $As = 0.1125$ sq. in. and

$Is = (5.65)^2 \times 0.1125 = 3.61$

$Ss = 3.61 + 5.65 = 0.638$

$$Ic = \frac{(15.3)^3}{12} = 305.4$$

$$\frac{Wc}{Ws} = \frac{EcIc}{EsIs} = \frac{305.4}{15(3.61)} = 5.64 = m$$

$$a = \frac{m}{1\ m} = \frac{5.64}{6.64} = 0.85$$

$b = 0.15$

$$fc = 0.85\left\{\frac{5340}{15.3} \pm \frac{6(5120)}{235}\right\}$$

$$= \left\{\begin{matrix}408 \text{ lbs. per sq. in.} \\ 185 \text{ lbs. per sq. in.}\end{matrix}\right\}$$

But this exceeds the allowable stress assumed (400 lbs.) and the section will have to have a larger area of steel, or the thickness of concrete must be increased. Inasmuch as the stress in the concrete is so near the safe limit, it would seem more economical to increase the area of steel slightly than to increase the area of concrete at this section.

Another trial of this section is made using 0.13 sq. in. of steel per inch width of the arch. This gives the maximum stresses in the concrete of +398 and +181 lbs. per sq. in. which are allowable. The values of a and b found for the new assumed value of area of steel are 0.83 and 0.17, respectively. The stresses in the steel are found to be +7214 and 5120 lbs. per sq. in. Since all these stresses are within safe limits section 12 will have sufficient reinforcement if 0.13 sq. in. of steel per inch width of arch is used.

The maximum area of steel required at any section determines the area of steel at all other sections of the arch. So if it is found that 0.13 sq. in. of steel is sufficient for the remaining sections of the arch, this will be the proper amount of steel to use. This area is equivalent to pairs of ⅜″ round bars spaced 3-⅜″ centre to centre. Any other bars may be used provided that an equivalent area of steel is secured. In general, bars should not be closer together than three diameters centre to centre.

Transverse reinforcement should also be provided, usually amounting to about ⅓ to ⅕ the area of the longitudinal bars. That is, the transverse reinforcement would usually consist of pairs of bars of the same size as the longitudinal bars but spaced from three to five times as far apart.

SHEAR.—Each section of the arch should be examined to see that the safe shearing strength of the concrete is not exceeded. Should it be found that any section is subjected to excessive shearing-stress, shear-bars should be provided. A satisfactory method of placing shear bars is to incline them upwards toward the abutments, the ends of the bars being hooked over the upper and lower longitudinal bars. The diameter of shear bars would depend largely on the amount of shear to be carried, though in general it would be from ½ to ¾ the diameter of the longitudinal bars. The spacing where shear must be provided for should not be less than the depth of the arch ring at such sections. In many cases it will be found that no shear bars are required.

TEMPERATURE STRESSES.—Stresses due to temperature changes may be computed by any of the methods given in the standard textbooks on mechanics. The stresses thus found may be added to those already found by the method explained, and the various sections designed to carry the stresses due to all dead and live loads and temperature changes. Or, the thrust at the crown due to temperature changes may be computed and added to the thrust due to dead and live loads. A new equilibrium polygon would then be constructed with a pole-distance equal to the sum of the two thrusts. From this the stresses at the various sections could be determined graphically, as before.

However, the usual range of temperature is so small in the Philippines that in most cases temperature stresses may be neglected without danger.

CONSTRUCTION.—Much of the sand, gravel and stone available in the Philippines is of poor quality. Before any important work is undertaken samples of concrete made of the materials proposed for use should be tested, and if not satisfactory better materials should be secured. Much of the gravel available is soft and unfit for concrete, some of the sand and gravel contains shells of various sizes besides organic matter and silt. In examining a reinforced concrete beam that failed in Manila portions of the concrete were found to contain shells having a diameter of an inch or more. Such portions could be broken readily by twisting in the hands, fractures occurring usually near the shell. For this reason it is believed that no shell should enter concrete which is to be reinforced with steel. Sand should be hard, clean and coarse. A microscopical examination of sand is often an aid in selecting a good grade. Sharpness is not absolutely essential though it makes a slightly stronger concrete.

The specifications for stone should require hard, sound stone free from earthy or vegetable matter and not larger than will pass a 1½″ ring for all reinforced concrete and not larger than will pass a 2½″ ring for plain concrete work. Weathered rock should be avoided, as it is not productive of good results.

A fair grade of Portland cement may be procured in the local market and this is of satisfactory quality. To insure uniform quality of cement every second or third barrel should be sampled and tests made when used in important work.

work and kept wet at little expense. A simple expedient for keeping concrete floors wet is to spread about two inches of sand over the entire surface as soon as the concrete has set, the sand being wet down at intervals. In this manner the concrete is wetted and protected from the sun at slight expense. The sand can be left on the floor till the building is completed, affording considerable protection against the blows and injuries that the concrete is certain to receive.

Forms.—Forms for small culverts may be made of a rough lumber frame work covered

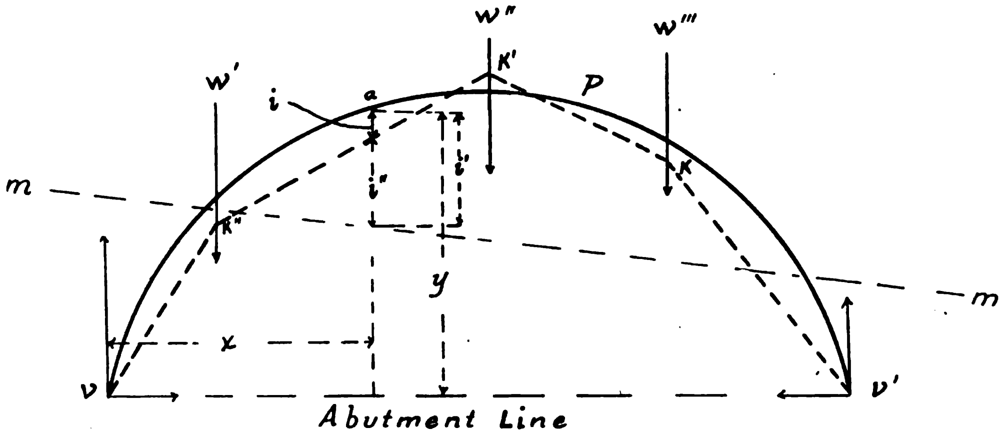


Fig 6

The metal used in a large part of the reinforced concrete work done in the Philippines is mild steel containing not more than 0.15 per cent carbon. Wrought iron may be used interchangeably with the mild steel the use of either obviating the necessity of testing such materials. An additional advantage is that either of these materials may be purchased in the open market at almost any time.

The most important feature of reinforced concrete after securing proper materials is to secure thorough mixing and placing. Almost any of the standard specifications used in the United States will prove satisfactory for mixing and placing concrete. The mixture that seems to give best results here is a rather wet but not *sloppy* one. This will require puddling with spades and will probably secure a better adhesion between the steel and concrete than the mixtures containing less water and requiring tamping. Careful supervision should be maintained on all concrete work for the purpose of securing as high quality workmanship as possible and strict conformity to the specifications.

Frequently it will be found that the steel bars of commercial lengths are not long enough to extend the full lengths shown in the plans. In such cases the bars should overlap a distance not less than 50″ to develop the full safe strength of the bar.

Reinforced concrete work should be wetted thoroughly every day for a week after placing and should be protected from the sun for at least two weeks if the best results are to be obtained. *Suale*, a coarse matting, is cheap and can be used to protect such work from the sun; *burlap* or *cogon* grass or wild banana stalks and leaves can be placed on top of completed

with suale or sheet-iron, though for the larger spans well braced ribs of trusses should be used usually spaced from 3 to 5″ apart with lagging of such depth that the maximum deflection will not exceed an eighth of an inch. If lightly toe-nailed to the ribs of false-work the lagging may be used a number of times before being discarded. A very satisfactory method of smoothing over the irregularities of the surface of the lagging after it is in place is to coat the entire surface with a very thin layer of a rather wet clay. This is done by simply taking a ball of wet clay and rubbing the surface of the lagging until quite smooth and all cracks in the lagging are filled up. This should be done just before the concrete is put in place.

On all arch or beam spans greater than 20″ the forms should remain for a period of at least 30 days. before removal of arch forms the back-fill should be made and wet down well.

Errata.—The pole-distance shown in the graphic diagram was obtained by the deflection polygon method. The value found by this method is not altogether correct. The correct value of the pole-distance determined as described in this paper is 64,000 lbs. while the diagram shows the pole-distance to be 66,850 lbs.

In the January number of The Review the following errors are noted:—Page 243 in formula (6) X should be x; page 245 in formula (9) place period to indicate multiplication in place of the first sign of division.

SZECHUEN-HANKOW RAILWAY

Japanese engineers have surveyed routes of various sections in Hupeh for the Szechuen-Hankow Railway at the request of Viceroy Chang-Chih-tung. The main line will start from the outside of the western gate of Han Yang (opposite Wuchang) and then run along the upper stream of Hankow for two miles by the south bank of the Hsiang (Han) River and then after coming to the plain there pass through Tsaitien, Shentao and Sincheng (where cotton and grain are produced) and then reach Shayang, and then turning to the south-west pass through Chingmenchow, Tang-yanghsien, etc., (mostly hilly, producing hemp), and reach Ichang, where connection will be made with the Yangtsze steamship lines. From Ichang the line passes through the mountain ranges of Chungshan and enters into Szechuen at Wanhsien, where the line will connect with that in Szechuen. A branch line starts from Shayang-chin on the left bank of the Hsiang (Han) River to Shashi on the right bank of the Yangtsze, and another line starts from Chingmenchow along the Hsiang River to the north, passing through Ichang and reaches Hsiang yang-fu so as to get cargoes from the western boundary of Honan and southern boundary of Shensi. The difficult portion of the engineering works is that between Ichang and Wanhsien, where there are mountain ranges making it difficult to cut routes. Viceroy Chang Chih-tung at first intended to have Kwang hsui-tien on the Peking-Hankow Railway as the starting point in the Szechuen-Hankow Railway. However, the Japanese engineer-in-chief suggested that it is not necessary to have the station competing with the Peking-Hankow Railway and Kwang hsui-tien is quite in the inside of a plain distant from water transport, thus inconvenient to supply cargoes; and that it is far better to have the terminus near Wuchang, Hankow and Hangyang, being in a very convenient position for land and water transportation.

GHIRBI COALFIELDS, MALAYA

These coalfields, which are situated about 200 miles to the north of Penang, near the Island of Tongkah, on the west coast of the Malay Peninsula, have been exploited by some enterprising residents of Penang and it is understood that before long the syndicate's *black diamonds* will be placed on the Penang market. Recent tests at the mines went off very well, and as the supply is practically inexhaustible and the fields are near Penang, and there is deep water close to the syndicate's wharf, it is fair to assume that, with the cheap transport thrown in, to the many attractions to the shipping and aids to the development and the vast resources of this country, will soon be added a plentiful supply of cheap and good steam coal, which while proving of incalculable benefit to various trades and industries both in the Straits Settlements and the neighboring British Protected States (Perak, Selangor, Negri Sembilan, and Pahang) will enable ocean liners and coasters to replenish their bunkers in Penang at a much lower cost than has hitherto been thought possible. The peninsula railways (Government concerns) should be great gainers, and that would mean advantages of no mean order for the public, who would be able to travel and transport their goods at lower rates than now obtain.

With cheap fuel, added to the plentiful supply of tin, ever-increasing quantities of the best plantation rubber, tropical produce of every description in abundance, and Governments pushing ahead with railways, roads, docks, and improvements in harbors, he must be a rabid pessimist indeed who would fail at this time to take a roseate view of the prospects of Malaya as a whole, and Pulau Penang in particular.

TOKYO-OSAKA ELECTRIC RAILWAY PROJECT

Some particulars are published as to the Tokyo-Osaka Electric Railway project. The Tokyo terminus would be in the Shimo-Shibiya suburb of Tokyo, that is to say, near the site of the power-station of the former Tokyo Electric Railway. The road would be on the *daisankijo* system, and the gauge would be 4′ 8½″, a double track. At the Osaka end the terminus would be the Noda-mura suburb, and the places of call *en route* would be Shizuoka, Matsuda, Nagoya and Kameyama. The establishment expenses are to be obtained by charging each

Table IV.—Stresses in Arch Ring.

Governing Points.	Moments in lbs. on Section 1″ wide	Thrusts on Sec. 1″ wide	Assumed Depth of Ring	Assumed Depth of Ring Ins.	
			ft.		
V′	28800	5540	4.67	56.0	Critical Point.
1	17960	5500	2.60	31.2	
2	19200	5450	1.75	21.0	Critical Point.
3	7040	5420	1.60	19.1	
4	5760	5380	1.48	17.25	
16	4480	5380	1.45	17.4	
15	6400	5360	1.37	16.5	
14	7680	5350	1.35	16.2	Critical Point.
13	5120	5340	1.30	15.6	
12	5120	5340	1.27	15.3	Critical Point.
11	3840	5330	1.25	15.0	Critical Point.
Centre.			1.25	15.0	

promoter 10 *sen* per share taken by him. The distance of the proposed route is 287 miles, being thus from 60 to 70 miles shorter than the State Railway, and an average speed of 50 miles an hour would easily enable the journey to be made in 6 hours, including stoppages, against 22 hours by the present ordinary trains, and 13 hours by the express trains. The engineering experts who spoke at the meeting in the Imperial Hotel recently, dwelt upon the glaring incapacity of the existing railway to meet the needs of communication between the two cities. They also insisted that no improvements in management can bring the State line to the level of the occasion, its appliances and capabilities being limited. The estimated cost of laying and equipping a line of the nature projected is ¥160,000 per mile, and if the distance be taken at 300 miles, a capital of about ¥100,000,000 would be required for the double line. The road would be able to transport a whole division of troops in one day if occasion arose. Charges would be of two kinds, ¥8 for first class tickets, and ¥4 for ordinary tickets, and the estimate is a net profit of about 9 per cent.

CROSSING SIBERIA BY RAIL

Vice-Consul-General Nelson Fairchild, of Mukden, reports to Washington that notwithstanding the prevailing idea that political disturbances have seriously interrupted the railway communications throughout Russia, the journey through Siberia and Northern Manchuria may be made with only the ordinary difficulties which beset the traveler. As information regarding the trip from London to St. Petersburg and across Siberia is not readily obtainable, the following information from Mr. Fairchild will be of interest:

Trains for St. Petersburg leave the Victoria station, London, daily at 9 a. m. to connect, *via* Dover, with the Nord Express at Ostend, which reaches Berlin at 7.40 next morning. The regular St. Petersburg express leaves at 10 o'clock, and after a 13 hours' trip the Russo-German frontier at Eydtkuhnen-Wirballen is reached. It is here necessary before changing trains, owing to the difference between the Russian and the German gauge, to pass the Russian customs and to submit passports for *visé* by the police authorities. Baggage is handled by a corps of porters, and the traveler is able to pass the time before the train leaves, at 1 a. m., in one of the excellent restaurants which are to be found at all the larger Russian stations. Those who wish to be certain of a berth in a well-lighted car should telegraph ahead. Leaving at 1 a. m., it arrives at St. Petersburg at 6.40 the following evening.

St. Petersburg to Moscow and Irkutsk.—The night *train de luxe* leaves St. Petersburg for Moscow at 10.30 p. m., arriving at 10.30 the following morning.

The regular Government trans-Siberian express leaves Moscow twice a week, on Sundays and Thursdays, at 12.10 a. m. (local time), the car-lit train leaving on Wednesdays. By taking the latter, however, it is necessary to wait one day at Irkutsk, while the other two trains, with two hours' leeway, connect with the Vladivostok express, and, except for the lavatory accommodations, the ordinary express carriages are quite as comfortable as the more expensive lighted cars. It is an eight-day trip without change from Moscow to Irkutsk. At the latter station, on account of the change of trains, it is necessary to secure a new berth. It will be found more convenient to have the agent in Moscow secure the ticket by telegraph. It is necessary to watch the baggage, as the platform is crowded and thieves are not uncommon.

Irkutsk to Harbin and Mukden. — From Irkutsk the train passes south of Lake Baikal, running very near the water's edge over a hastily constructed roadbed which requires constant watching. It is proposed to build a second line farther to the south, avoiding the mountains which surround the lake. The run to Harbin is five days without a break, at Karamskaia the line changing from the trans-Baikal to the Chinese Eastern Railroad. At about 11 a. m. (local time) the train reaches Harbin, where those going south must change to the old Port Arthur line, the express going through to Vladivostok, arriving there thirty-six hours later.

The south-bound train leaving Harbin at 10.30 p. m. for Changchun (Kwangchentzu) does not compare with those on the main line, consisting of ordinary post cars. Changchun, the last station on the Russian line, is reached at 10 the next morning.

The Japanese railroad begins 5 miles south of Changchun. The schedule has not yet been completed, but there is at least one train a day each way, consisting of one second, a number of third-class, and box cars. Mukden is about sixteen hours away on the main Port Arthur line.

Accommodations and Food.—The St. Petersburg express leaving Berlin is composed of comfortable first and second class vestibule carriages, with a good dining car attached. From Wirballen to St. Petersburg there is a regular carriage-lit train, while the express between St. Petersburg and Moscow is the best train in Russia. It is made up of lighted cars of the latest type. The Moscow-Irkutsk Government express consists of first and second class cars only. The first-class compartments are for two or four, while the second-class accommodates four persons. Each compartment is fitted with a small table and electric reading light, and there is a lavatory at either end of the car. From Irkutsk on the trains are built on the same plan, but slightly larger, with three lavatories.

On all the Russian trains (except that between Harbin and Changchun) there is a restaurant car, where the prices are reasonable and the fare, though good, is monotonous. As the stops are long, a change of menu may be found at the station buffets. It is unsafe to drink unboiled water, but Russian and other mineral waters are supplied at low rates. The light Caucasian wines are good and cheaper than French or German clarets or hocks. Russian beer is fairly good, and at the stations peasants offer bottles of milk for sale, while tea or coffee may be had at any hour of the day.

Baggage, Language, etc.—Baggage may be registered through to Harbin or Vladivostok on the payment of a not excessive charge, but only 54 pounds is allowed free on a single ticket. The staterooms, however, are large enough to permit the carriage of pieces the size of a small steamer trunk.

Neither towels, soap, nor toilet paper are furnished on the trains. It is well, also, to buy such postage stamps as may be needed for letters to be posted en route, as they are difficult to obtain at the stations. Blankets are necessary both at Harbin and on the road south.

A knowledge of French or German, preferably the latter, is most useful, as the porters do not, as a rule, speak English. An open letter to the station masters from the minister of ways and communications will be found valuable, should any difficulty arise, and a passport visaed by the Japanese minister would be useful in transferring from the Russian to the Japanese lines at Changchun.

Condition of Roads, Commercial Towns, etc.—The rails throughout are very light, about 60 pounds in weight, and the roadbed is poorly ballasted. Both show the effects of the heavy traffic. From Cheliabinsk on there are single sidings every 5 versts, with many more at each station. The railroad is divided into three parts—the trans-Siberian from Moscow to Cheliabinsk and Irkutsk, the trans-Baikal from Karamskaia to Vladivostok.

Connecting with the trans-Siberian line there are branch railroads from Cheliabinsk to Ekaterinburg and Perm, shortly to be connected with a road from St. Petersburg via Vologda; from Taiga to Tomsk, and from Karamskaia to Stretensk. Cheliabinsk, moreover, within another year will be connected with Irkutsk by a second line to the south, and a new circum-Baikal as well as a Stretensk-Harbarovsk line is contemplated. Water routes and connecting railroads, both constructed and projected, supply the main arteries, and only the network of the connecting lines is necessary to complete the opening of the country.

The towns along the line appear to be fairly active, growing places, with their saw and flour mills, distilleries, and factories. The larger ones, such as Cheliabinsk, Petropavlosk, Omsk, Kainsk, Taiga, Ilanskaia, Nijnieoudinsk, Irkutsk, and Tchita, show signs of great commercial activity.

Population and Resources.—The bulk of the population of Siberia is made up of emigrants and exiles from Russia proper. At present the exiles form only from 8 to 9 per cent of the whole, and this proportion is decreasing, while the number of voluntary emigrants is growing each year. The latter are chiefly farmers, who are given Government land, rent free for a number of years, after which they are obliged to pay a small tax.

The native population consists of nomadic tribes—the Kirghiz, Tartars, Turks, Mongols, Bukhariots, Samoyedes, and Buriats—living in felt tents. They are not agricultural but pastoral races. Their flocks and herds provide food, clothes, and shelter, and they rely on the frequent fairs held at large towns to meet and exchange commodities for their other needs.

The natural resources of the country are great, large mineral deposits being found throughout; gold, which is the most important, forming one of the chief sources of wealth. After it, in the order named, are coal, iron, silver, lead, and salt, as well as quantities of precious stones. These mines are worked by primitive methods, though in the Tomsk district some modern American machinery has been introduced, and the output is at present very considerable and annually increasing. Although the numerous coal and iron deposits have not been extensively exploited, coal is furnished in sufficient quantity for railroad use, and a certain amount of pig iron is exported. Silver, lead, salt mines, and oil wells, though not as important, are profitable, and contribute to the general wealth of the country. Timber also, if felled under proper restrictions, should be a constant source of revenue both to the Government and to the lumbermen.

Industries.—A certain amount of capital is invested in canneries, for the country abounds in rivers and lakes, which are supplied with fish in abundance—salmon, sturgeon, sterlet, and trout.

Farming is the chief industry of Siberia, for the Russians are essentially an agricultural people. Partly, however, owing to the crude implements in use and partly to the community ownership of land, the production has been small in comparison with the fertility of the soil. Agricultural machinery has not been employed to any great extent, notwithstanding the enormous area capable of cultivation; and the peasantry are content to work their farms by hand. Common ownership of land, as in Russian Siberia, interferes with proper fertilization and rotation of crops, for the land is each year divided by their head among the various members of the community according to the size of the families. The peasants consequently regard any attempt to improve land that they are to part with at the end of the year as a waste of time and money. Furthermore, each family's land is arbitrarily subdivided into three portions; one for planting, one for grazing, and one to lie fallow, reducing the possible cultivation to two-thirds of its natural extent.

In spite of the defects in the Russian system great quantities of grain are exported annually. Wheat is the principal crop, but rye, barley, oats, flax, linseed, and beet root are cultivated as well. In many parts the absence of snow and the shortness of the summer presents serious difficulties, yet two crops are almost invariably handled each year.

Cattle, sheep, and horse breeding form another important industry, and furnish the supplies used by the meat canners, as well as the establishments for the production of cheese, butter, tallow, and soap.

Imports, Exports, Rivers, and Crops.—The tea traffic between Siberia and Mongolia and China forms the largest import trade. Other imports are piece goods, groceries, glass, finished metal goods, and pottery. Exports consist of grain, flour, linseed, coal, tallow, butter, cheese, hair, skins, furs, and cattle.

Out of the great number of Siberian rivers few are navigable, and those that are are closed during such a large part of the year that the

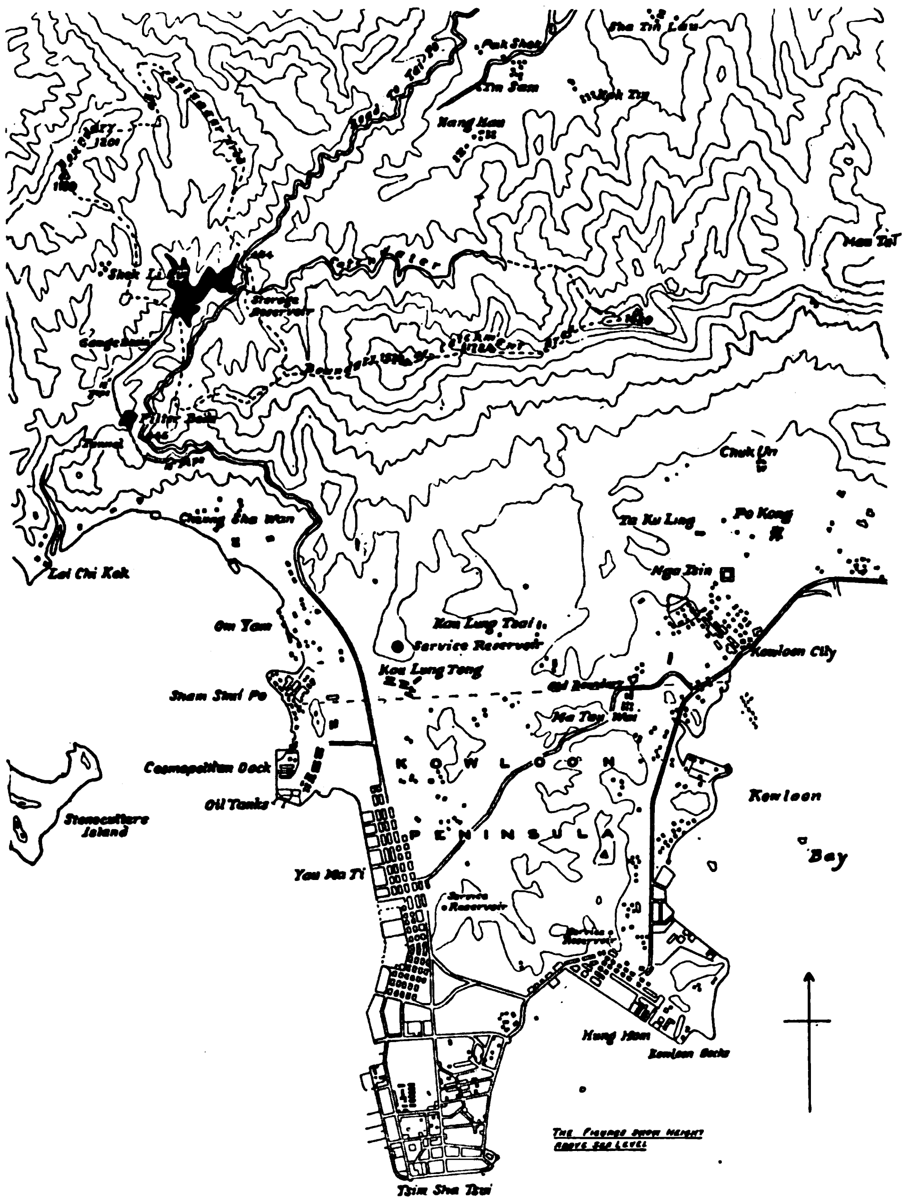
(Continued on page 335.)

GENERAL SCHEME AND CONSTRUCTION OF THE KOWLOON "HONGKONG" WATERWORKS SYSTEM

(Specially written for THE REVIEW by L. Gibbs, A. M. Inst. C. E.)

Prior to the year 1898 the mainland portion of the Colony of Hongkong comprised an area of about four square miles only. In 1891 the population of this area, known as the Kowloon Peninsula, including those living in boats near the shore, amounted to 26,500. It was about this date that the necessity for the public supply of water first forced itself upon the attention of the Government of the Colony. It being undesirable to obtain water from what was then Chinese territory the sources of supply were consequently somewhat limited. A scheme was proposed by Mr. Osbert Chadwick, Consulting Engineer to the Colonies, for obtaining water from the flat sandy valleys in the northern part of the peninsula. This scheme was carried out uuder the direction of Mr. F. A. Cooper, Director of Public Works for the Colony of Hongkong. The works were completed in 1895 at a cost of $116,000 (Mexican currency). Three valleys, having a joint area of 220 acres, were reserved as a collecting area, the water in the flat sandy bottoms of these valleys being intercepted by collecting pipes and led to shallow wells, below which dams were built across the valleys to prevent the escape of water underground. The wells were connected by iron pipes to a tank having a capacity of 150,000 galls., at Yau-Ma-Ti, and from this tank the water was pumped into the distributing mains, the supply being regulated by two small service reservoirs, one near Yau-Ma-Ti 215′ above sea-level and of 160,000 galls. capacity, and the other at Hung Hom 160′ above sea-level and of 90,000 galls. capacity. The minimum supply obtainable was estimated to be 232,000 per day.

ORIGINAL AND REVISED NEW SCHEME.—In 1898 the consumption was found to be rapidly overtaking the available resources of supply, and at the same time the acquisition of what is known as the New Territory, an area of about 350 square miles—the mainland portion of which lies to the north of Kowloon Peninsula—gave promise of increased facilities for obtaining water. Under these circumstances, the writer—then an engineer in the Public Works Department—was instructed to report on the question.



GENERAL PLAN OF THE KOWLOON (HONGKONG) WATERWORKS SYSTEM

The physical conditions of the country and the incidence of the rainfall made a storage scheme the only practicable one. There are no large watersheds, the country being a jumble of grass-covered hills rising from a few hundred to 3,000′ divided by boulder-filled watercourses, carrying torrents during the summer rains, and almost dry during the northeast monsoon. Here and there these watercourses broaden out into comparatively flat valleys and make possible reservoir sites. The average yearly rainfall is 84″; of this, 58″ fall during the four months of May to August.

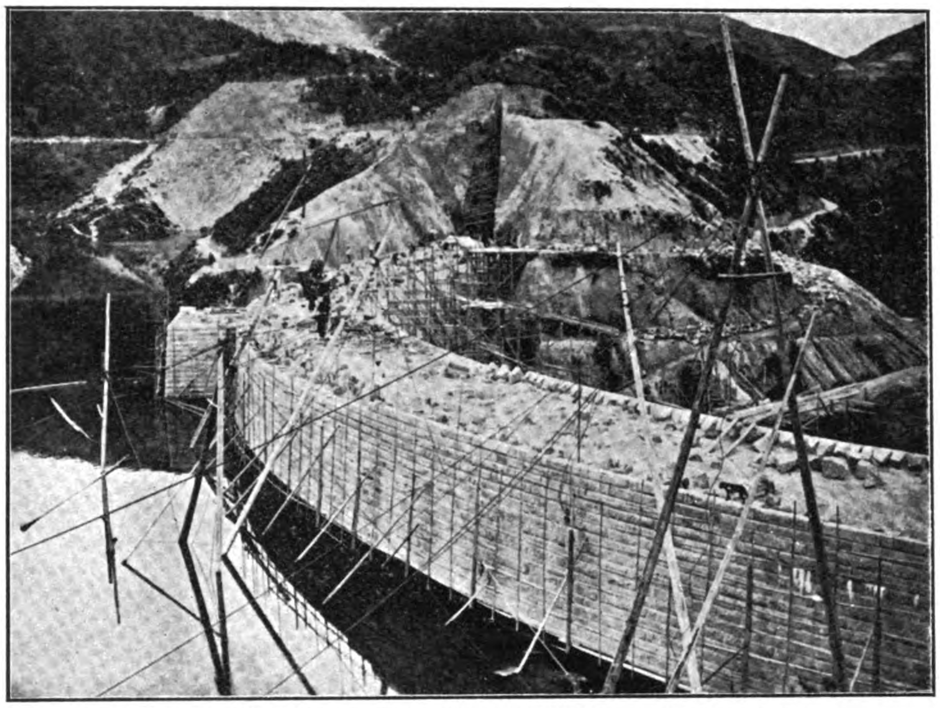
The scheme originally proposed comprised a storage reservoir of 120,000,000 galls. capacity, formed by an earthen dam 65′ high, and commanding a drainage area of 330 acres. The lowest draw off was to have been at 390′ above sea-level, giving ample head above all the inhabited parts of the peninsula; filterbeds, a new service reservoir of 2,000,000 galls. capacity, and extensions of existing mains were provided for. The works were estimated to cost $380,000 (Mexican currency) and to provide a supply of 590,000 galls. a day. This scheme was approved by the local authorities, and submitted to London for the sanction of the Colonial Office. The Consulting Engineer, Mr. Chadwick, while generally approving the scheme, advised that a masonry dam be substituted for the proposed earthen dam.

About the time that this scheme was under discussion there occurred an unprecedented expansion in the population of this part of the Colony. The land population of the peninsula, which in 1891 stood at 20,000, was returned by the census of 1901 as 44,000, and to this had to be added—for purposes of water supply—the floating population and two small towns known as Kowloon City and Sham Shui Po, in the New Territory; so that the population then requiring water amounted to 66,000 as against 44,000 when the scheme was drawn up in 1899. It therefore appeared probable that the original scheme, if carried out, would very soon be out of date. At the same time it was found that a more suitable site for a masonry dam than the site originally selected for the earthen dam existed at a point lower down the stream, and that at this site a dam could be constructed giving a reservoir of 350,000,000 galls. capacity, whilst still giving ample head above the district to be supplied; and this project was eventually selected as the one to be put into operation. The writer in the meantime having left the public service and joined the firm of Messrs. Denison, Ram & Gibbs, his concern was entrusted with the carrying out of the work.

DETAILS OF THE CONSTRUCTION.—This final scheme, which is now fast approaching completion, comprises a storage reservoir to hold 350,000,000 galls. of water; two miles of catchwater channel; three filterbeds, each capable of filtering 500,000 galls. per day; a service reservoir holding 2,000,000 galls.; the necessary connecting pipes of castiron between storage reservoir, filterbeds and service reservoir; and about seven miles of additional mains to extend the present distributing system.

The storage reservoir is formed by a masonry and concrete dam which, when finished, will be about 600′ long on top and 112′ high from the lowest part of the foundation. The mass of the dam is of cement concrete varying in proportion from 1 cement 2 sand 4 broken stone to 1 cement 2½ sand 6 broken stone. The cement used is mostly the Hongkong "Green Island" brand. At the commencement of the work English cement supplied by Messrs. Knight, Bevan & Sturge was used, and at one time a consignment of German "Hermoor" cement was procured. A comparatively low test was demanded and all these cements have given satisfaction. The sand is sea sand obtained from beaches on the neighboring coasts, and the stone is hard igneous rock found in the neighborhood and hand broken. In the mass of concrete stones are bedded averaging about three cubic feet each, no stones being nearer together than 6″.

The water face of the dam is of granite masonry dressed on beds and set in cement mortar, and behind this is a backing of rich concrete, 5′ thick at the bottom and reduced to 2′ thick at the top. The outer face is of rubble masonry set in cement mortar. The dam is of a gravity section and curved on plan, the curvature being introduced to avoid a deep drop in the stream bed and at the same time to take advantage of projecting spurs in the sides of the valley to reduce the length of top-water level.



KOWLOON WATERWORKS.—MASONRY DAM OF THE STORAGE RESERVOIR

The foundation for a length of 400′, and to a level of about 40′ below overflow level is on hard rock, and above this the ends are keyed into decomposed granite. The outlet appliances are contained in a valve tower on the inner face of the dam, and consist of 10″ castiron standpipe with four inlet pipes commanded by 6″ valves and fixed at different levels so that the water will always be drawn from near the surface of the reservoir.

A subsidiary dam about 20′ high, built in a convenient depression, forms the overflow or byewash dam. This is 100′ wide in ten 10′ openings and is designed to pass stormwater at the rate of 4″ per hour from the natural drainage area with 1″ per hour from catchwater area with a head of 4′. The recorded heaviest rainfall in Hongkong occurred in May, 1889, when 11.9″ fell in four hours.

Movable iron sluices are provided on the top of the byewash dam. These are to be let down when the heavy rains have ceased at the end of the summer, and will thus in ordinary seasons impound an extra 2′ of water without raising the water-level to a greater height than it would reach during a heavy rainstorm.

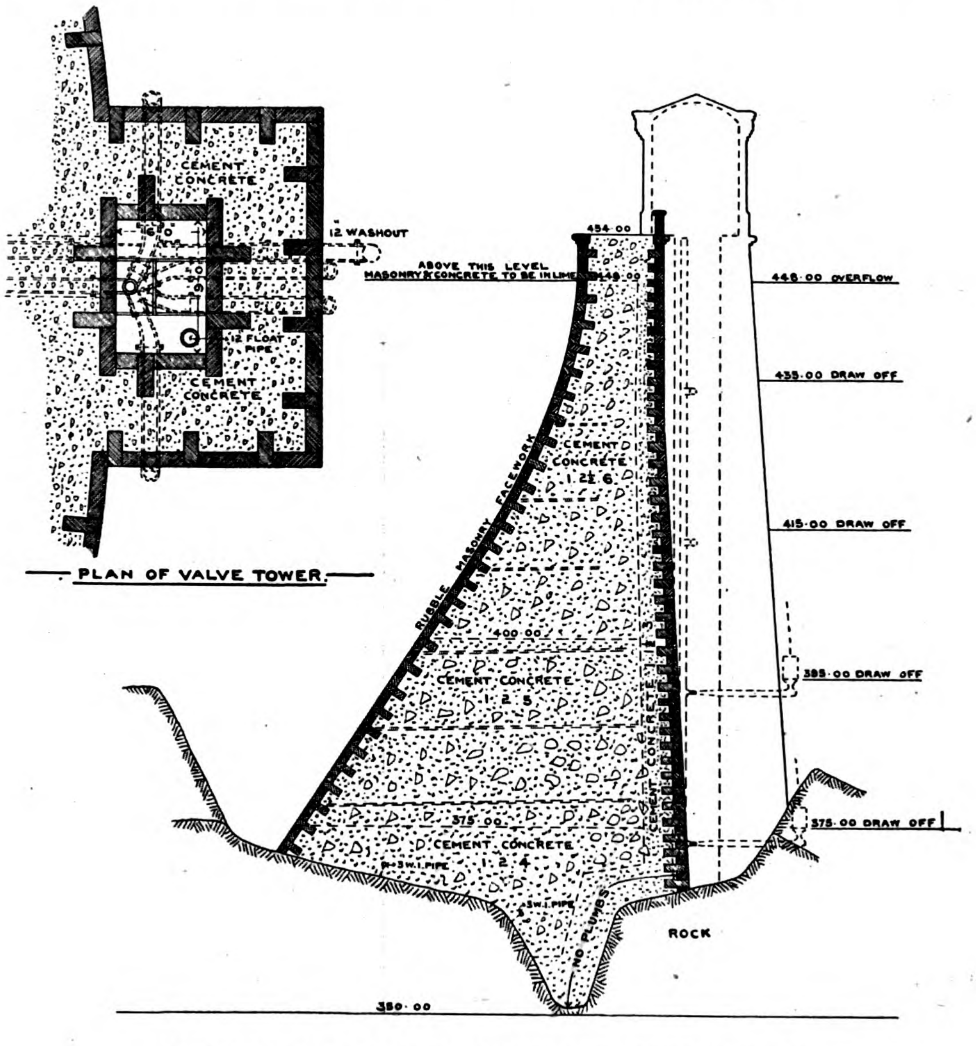
Drainage and Overflow.—The natural drainage area of the reservoir is only 460 acres. Experience gained with storage reservoirs on Hongkong Island has led to the conclusion that it requires about one square mile of catchment and a storage of about 200,000,000 galls. to provide 1,000,000 galls. a day. It was therefore evident that the drainage area must be increased. For this purpose a catchwater channel was constructed, intercepting the flow from an area of 400 acres. This catchwater is an open channel cut on the hillsides at a gradient of 1 in 2,400 and lined with concrete. In the bottom of the catchwater a small V-shaped channel is constructed to carry the dry-weather flow and prevent its loss by evaporation if spread over a broad surface. It is estimated that the catchwater will carry from ½″ to 1″ of rain per hour from the drainage area of 1,000 acres. Overflows are provided in suitable places, which will come into action when the rainfall exceeds this quantity. At the lower end of the catchwater, the dry-weather flow channel is connected to a small channel, passing round the side of the reservoir, and connecting by means of an 8″ castiron pipe to the gauge basin on the main supply pipe from the reservoir. This is called the *clearwater channel*, its function being to intercept the water from the streams and carry it direct to the filterbeds, as after heavy rains the water in the reservoir will remain for some days so turbid as to be practically unfilterable.

Filtration.—From the storage reservoir a 10″ castiron pipe, on a steady gradient, leads to the gauge basin already mentioned. From this gauge basin an 18″ castiron pipe, at a uniform gradient of 1 in 1,000, conveys the water to the filterbeds. These are three in number, each of 800 square yards area, the filtering material consisting of 3′ 6″ of sand on 1′ of broken stone, arranged for downward filtration. Adjustable outlets will be provided to maintain a constant height of water in the beds, and Venturi meters to record both the rate of filtration and the total flow. After leaving the filterbeds the water will pass through a short tunnel in castiron pipes which are continued for about three miles to connect with the old distributing system, passing on the way a Venturi meter which will measure the total supply.

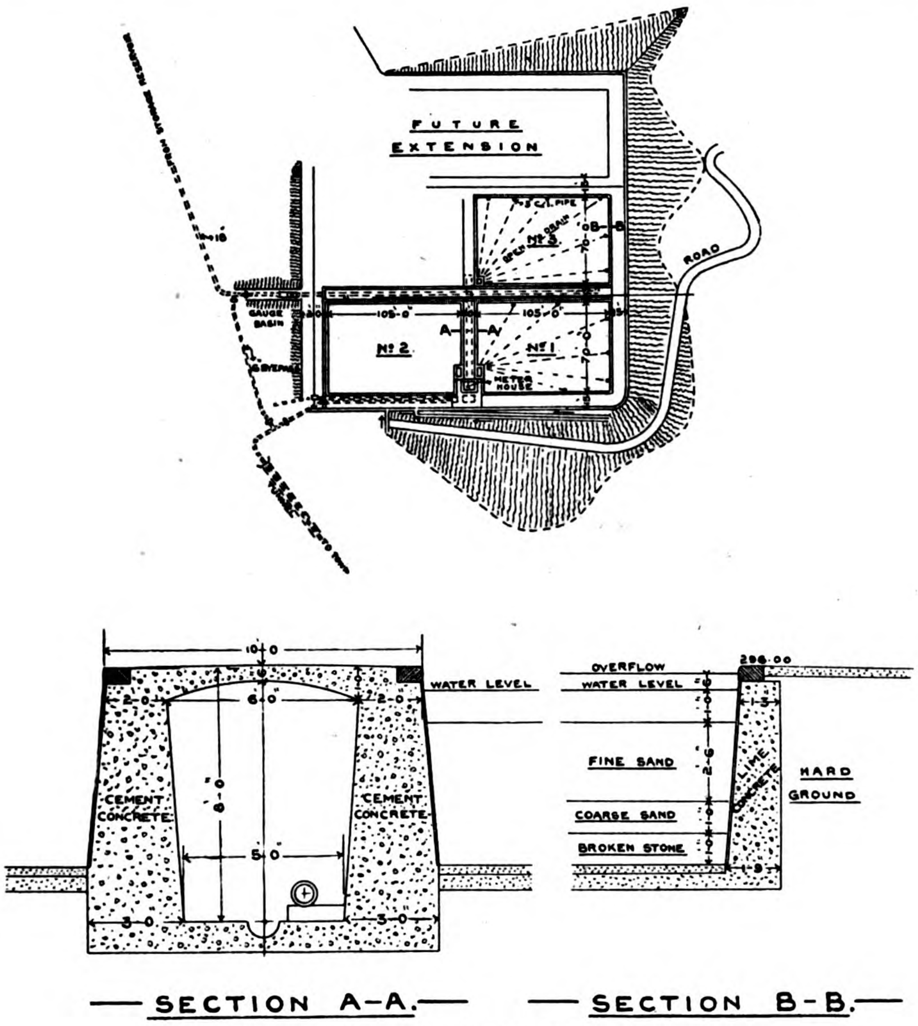
Service Reservoir.—The service reservoir is situated on a hill of decomposed granite just beyond the old boundary-line of the British territory, no site at a suitable height being available near the center of the supply district. It is built entirely in cutting, with floor and sidewalls of cement concrete, and vaulting of the same material carried on brick arches and stone pillars. The reservoir is 150′ in diameter and 20′ deep, and has a capacity of 2,000,000 galls., the in and outlet pipe being arranged so that the water flows in at the top and out from the bottom of the reservoir, thus insuring aeration and circulation.

Water Supply.—The water is supplied in the Chinese quarter by means of self-closing taps, fixed about 100 yards apart at the sides of the streets, all water laid into private premises being charged for by meter. Ball fire hydrants will be fixed about 100 yards apart on all mains in the built area.

Supplementary.—The construction is being done by Chinese contractors from the designs and under the supervision of Messrs. Denison, Ram & Gibbs. Concreting was commenced on the storage reservoir main dam in January, 1904, and the masonry is now within 30′ of overflow level and impounding about 100,000,000 galls. of water. The catchwater is nearly complete, the filterbeds and service reservoir in use, and the extension of the distributing system well in hand. The total cost of the improvement is estimated to amount to $1,200,000 (Mexican currency), and the supply in the driest year to 1,500,000 galls. per day.



KOWLOON WATERWORKS.—MAIN DAM UNDER CONSTRUCTION

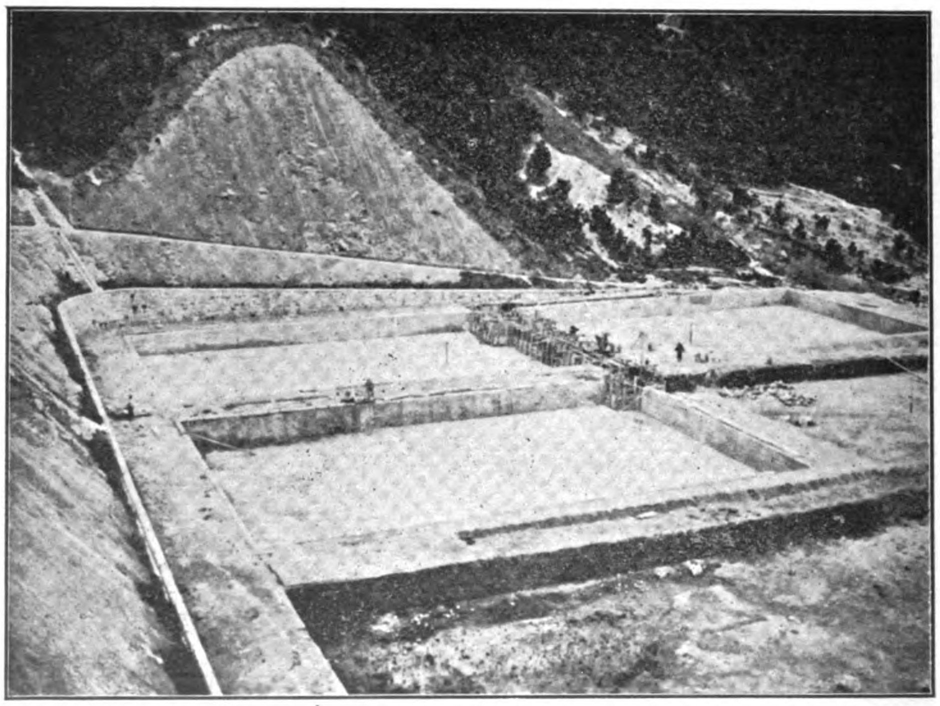


KOWLOON WATERWORKS.—PLAN OF THE FILTER BEDS

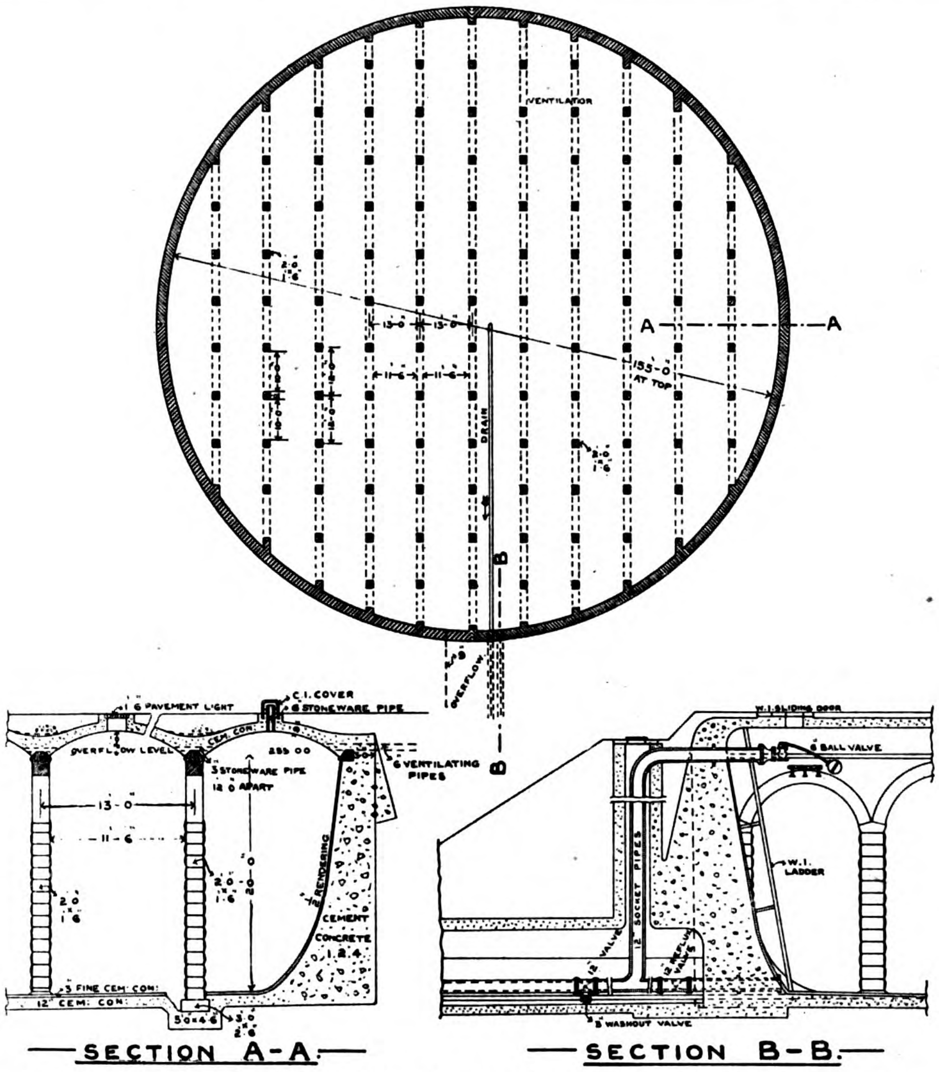
GREEN ISLAND CEMENT COMPANY, LTD., HONGKONG

The 18th ordinary general meeting of the shareholders in the Green Island Cement Company, Ltd., was held recently at the offices of the general-managers, Messrs. Shewan, Tomes & Co., of that city. There were present Mr. R. Shewan (in the chair), Hon. Mr. W. J. Gresson, Dr. J. W. Noble, Sir Paul Chater, consulting committee; Captain W. E. Clarke, and Messrs. R. Hancock, F. Ellis, A. H. M. Silva, and R. Henderson, secretary.

Chairman's Address.—The address of Mr. Shewan was as follows:—"The report and accounts for 1906 were issued to you on February 18th, and as I presume you are all quite familiar with their contents, I will not read them now, unless you desire me to do so. Our working account shows a slightly higher profit, but the amount for division is less owing principally to the fact that 1905 commenced with a balance at credit of profit and loss of some $95,000, brought forward from 1904, while 1906 began with only $52,000. The final result, however, is that we are able to pay $368,500 away in dividends this year as against a total dividend and bonus last year of $375,000, not a very great difference. As ample provision has been made for depreciation we only propose to place a nomina' sum to reserve fund which being invested in our business is really additional capital, and not actual funds kept in reserve as it should be. The result of the year's work is, I trust, satisfactory to shareholders, but it would undoubtedly have been worse owing to the course of exchange which enabled cement makers at home to offer their brands out here at lower silver prices which we, of course, were forced to accept or lose the business, had it not been for our increased output which affects this reduction in prices. In other words, we did a larger business to make up for lower prices. As for the future, although I do not care to indulge in prophecy, I can say that this year has begun well, and that our present prospects are very good, if exchange does not hit us any harder. The consumption of cement, as every engineer will tell you, has increased, is increase ing, and will increase. The use of reinforced cement concrete is growing rapidly all ovr the world, and should be especially in favour out here where our buildings are so subject to the attacks of white ants, dry rot, etc. The rotary kilns which we added last year took longer than we anticipated to get into thorough working order, but they are causing little trouble now and their outturn is giving us the greatest satisfaction. In fact they have produced so much more than was anticipated that to enable the grinding plant to keep up with them we had to order additional mills. These with the new boiler house extension and new saw mill building principally account for the expenditure of $166,000, at Hok Un, where, as I told you last year, we did not expect to spend more money. Another lakh has been spent at Macao, but it has been well spent on economies from which we are making an excellent saving in working expenses. As you are all aware a cement plant which was intended for erection in Manchuria, but which had been landed here during the war, was offered for sale at auction in June last, and as it was for obvious reasons desirable that this plant, which, however, was far from complete, should not get into other hands, we decided to acquire it for this company. It is now in course of erection, and will, when completed, add two more rotaries to the present two, just doubling the output of our rotaries. We shall not, of course, commence running this plant until circumstances require it, but if the consumption of cement continue to grow, as it has done in the last year or two, it should not be standing idle long, and in the meantime the loss of interest is not very serious. This, with the expenditure I have mentioned at Hok Un and Macao and about $47,000 at Deep Water Bay, where we have added a large pipe machine, accounts for nearly $600,000. In addition to this we had on 31st December $136,000 more than last year owing by sundry debtors, $50,000 more spent on launches and lighters, mostly for cost of two new lighters, and about $240,000 more in stocks of cement and raw material on hand equal to $426,000, making a total expenditure of over $1,000,000. Our stock of cement is large,but not too large for our purposes, as new cement takes a long time to mature, and thus we are compelled to carry large quantities in stock. We cannot, as you quite understand, afford to allow green cement to go out of the factory. In this way the $500,000 we received from you for new capital and the increase of nearly six lakhs in the over draft at the bank is accounted for. The payment of the dividend will increase the latter by $250,000, and this brings me to the old question of more funds, for we cannot go on doing a bigger and a bigger business without more and more capital, and we cannot always depend on borrowing money from our bankers. We require roughly $1,100,000 to make us comfortable, and to get this we propose to issue 200,000 shares to share-



KOWLOON WATERWORKS.—FILTER BEDS NEARING COMPLETION



KOWLOON WATERWORKS.—PLAN OF THE SERVICR RESERVOIR

holders, one new for one old, calling up on each $5.50 in one payment in July next, and to raise these shares to $10, paid up, we propose crediting a call of $4.50 on them, which will absorb $900,000, out of the reserve fund, which will then be reduced to $11,000. I hope I have made it clear to you that this proposal means that shareholders will only be asked to provide $5.50 per share in cash, the $4.50 being given them from the reserve fund, and I trust that this plan which, of course, will be brought before shareholders in the usual way at an extraordinary meeting later on will commend itself to you. This would raise the capital to $4,000,000, but I must again remind those who think that another similar factory could be started at once and run for the same capital that this does not by any means represent all that was, I will not say lost, but consumed at the outset in making experiments and gaining experience and all of which was written off *en bloc* when the company at last began to get on its legs. It is an experience which every new factory must expect to encounter, and which it will have to take into account and to pay for out of capital and had we not dealt with it in the beginning, our own capital would have been very much larger. I would also suggest that the fee for the consulting committee, which has stood at the low figure of $1,500, since the beginning, should now be raised to a figure more commensurate with the increased business we are doing, say to $4,000 per annum. I think I have now laid as full a statement of what we have been doing during the past year as I can, without going too deeply into details, but I shall be glad to amplify it if any shareholder is not clear on any point. I must add, before I sit down, that the erection and construction of so much new plant and machinery has thrust a great deal of extra work on Mr. Uldall, the manager, and Mr. Hewitt, the engineer in charge, at Hok Un, and that we feel much indebted to them for the cheerfulness with which they have given up their spare time and the readiness of resource with which they have met all difficulties inseparable to new work with unskilled labour, in all of which they have been well supported by the manager at Macao, Mr. Hoyes, and the staffs at both places.

There were no questions asked.

The chairman proposed the adoption of the report and accounts.

Dr. J. W. Noble seconded.

Carried.

Mr. R. Hancock proposed that Sir Paul Chater, Hon. Mr. W. J. Gresson and Dr. J. W. Noble be re-elected to the consulting committee.

Mr. F. Ellis seconded.

Carried unanimously.

Captain W. E. Clarke proposed that Messrs. W. H. Potts and A. O'D. Gourdin be re-elected auditors for the coming year.

Carried *nem con.*

The Chairman—That is all the business, gentlemen. Dividend warrants are ready now.

The meeting then ended.

FAR EASTERN NOTES

Space at the Japanese managed commercial exhibition at Mukden, Manchuria, is available to American manufacturers and exporters.

The first official report on the 1906-07 rice crop of British India gives the acreage in the provinces reporting, representing about 38 per cent. of the total area planted to rice in that country, as 50,900,200 acres, against 51,058,500 acres reported for the same provinces in 1905-06.

Every effort possible is being made to use native woods for ties in building the railways in the Philippines.

Loans are freely made by the Philippine Commission to the various provinces for the erection of public buildings in the islands.

A Japanese shoe manufacturing concern has secured a contract for shoes for the British army in India. It is one of the largest shoe contracts ever placed.

Formosa's foreign trade amounts to nearly $25,000,000 gold yearly, and is increasing at the rate of 10 per cent. a year.

The Tokio Electric Company, with financial and other assistance from the General Electric Company of Schenectady, N. Y., is manufacturing electric supplies for sale in Japan and over the Far East.

Instead of exporting its zinc ore, as formerly, Japan will smelt it and sell the product in the markets of China and Corea.

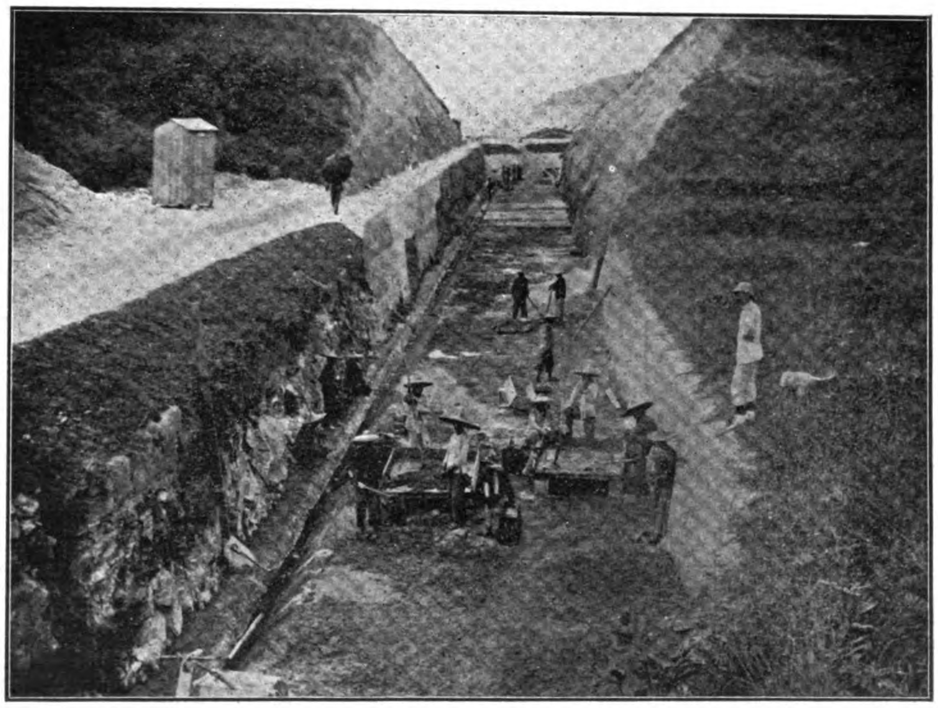
American and German locomotives have outclassed British locomotives as to sales in Japan.

Western Australia is buying mining pumps freely.

Japan's tobacco harvest is large. The Government profit will be 32,000,000 yen ($16,000,000).

Borneo tobacco sold this year in the United States for the first time.

The floating dock of the German colony at Tsingtau, China, is capable of caring for vessels, of 16,000 tons capacity. All the appliances are modern.



KOWLOON WATRRWORKS.—CATCHWATRR CUTTING UNDER CONSTRUCTION

MACHINERY IN INDIA

India as a buyer of machinery has peculiarities and limitations, yet the purchases are increasing and the market once secured is permanent. In seeking to supply it, the distinguishing characteristics of the native population must always be borne in mind. The manufacturing industries of the country are few, and outside of the cotton and jute mills factories are not numerous; but there are a vast number of hand industries which require certain types of machines. The requisites for supplying them are simplicity and comparative cheapness. Novelty is a drawback. The Hindu is as conservative in his methods of labor as in his religion. He prefers the patterns and designs which his fathers have used, and while he can be got to accept innovations when their greater utility is demonstrated, this only can be done by conforming outwardly as far as possible to the models to which he has been accustomed.

Allowing for the persistency of habit, importers of machinery say that the native workers show excellent mechanical capacity, provided the machines which they are put to operate are not too complicated. Their hands are deft and their feet also. But the excessive cheapness of coolie labor always has to be borne in mind, and also the low wages, which, in the mechanical pursuits, are a little above agriculture. When 25 cents a day represent the earnings of an artisan, neither high efficiency in production nor marked mechanical skill can be expected. Nor, outside of the cotton mills, are manufacturing plants with large capital to be looked for. In many industries an investment of 100,000 rupees, or $32,000 gold, is the limit; but it must be understood that, as measured by prevailing economic conditions, $32,000 in India stands for as much as $100,000 in the United States. Yet the best market is not to be found in plants of this character, but rather in the infinitely larger number of small shops where an investment of from $500 to $2,500 supplies the necessary outfit. Some of these are practically cottage industries. A dozen streets in Bombay are given up to them, and a day or two spent in these crowded quarters shows how the multitude of the small shops which exist for every possible purpose from repairing an automobile to drilling a hole, in a copper plate, in the aggregate make the demand for machinery an important one.

The United States has inserted the thin edge of the wedge into this trade and American manufacturers may find encouragement from the admission of some of the ultra conservative British houses that they are at a disadvantave in competing with the machine tools of the United States. In several lines of metal-working machinery they would be compelled to depend on their American competitors if sufficient enterprise were shown by the latter in cultivating the Indian trade. As it now is the direct imports of this class of machinery are not large, though a fair quantity is transshipped in England from consignments made without the American exporters knowing the destination. But these transshipments are usually only to fill out where the British manufacturer is unable to supply what is wanted, and are a hindrance rather than a help to American articles.

Among the manufacturers for which a permanent and reliable market now exists in Bombay are small forges, lathes, drilling, planing, punching, shearing, and similar tools that can be operated by hand or foot. The use of lathes operated by foot power and of drills is increasing, and the American manufacturers would add to their sales if they paid more attention to providing their products with bed gaps so that the machines could be fastened to the bench. Most of those now forwarded are for fastening to the post or wall, but the Hindu wants them attached to the bench, since that conforms better to his manner of working.

Some small steam drills have been imported from the United States and have given satisfaction; but, for the reasons already stated, the larger sale is for the hand drills. The great body of the consumers are not able to provide themselves with steam power. In all kinds of metal-working machinery intended for India the American manufacturers should consider solidity rather than lightness of finish or novelties in the way of improvements.

For generations the only pattern known to the Hindu has been of the heavy British type, and while he is not averse to availing himself of improvements, as is shown by the market that has arisen for the American metal-working tools, he takes most kindly to those which are of the solidest pattern. So long as increased efficiency can be demonstrated, it is better not to insist on offering him the further advantages of finish and what the British importers of machinery call "Yankee gimcracks." It may be added that a technical physical demonstration is all that counts with the Indian buyer. Illustrations, descriptions, and the fluency of the most persuasive salesman go for nothing unless all that is claimed can be shown before his eyes. A working model is essential.

The United States is now sending each year to India by direct shipment about $50,000 gold worth of pumps and pumping machinery, most of which is imported through Bombay. Hand pumps command the largest sale, and a firm at Salem, Ohio, is the leader in the trade. These hand pumps answer the native needs in every respect Some American steam pumps are also imported, and the best market for these is for general service ones. The large number of bungalows or villa residences which form a feature of the life of the well-to-do classes, both European and native, and which require a complete plant for their own use, afford a constant market for pumps of all kinds. Windmills in some sections of the country have a good sale. The demand for triplex-power irrigating pumps is a good one. The gearing should be about one-half higher than for the same pump in the United States because the bullocks and water buffaloes, which in India take the place of the horse, move at a very slow gait.

There is an opening for small hand presses in India. What is known as the Anglo-Indian press—that is the newspaper and other publications in English—has some very fine modern plants with the latest improvements in American presses. But these orders are given through London, and the trade is not one that offers new prospects. The real opportunity is in supplying the native or vernacular press both for newspaper and for job purposes. The number of daily and other journals published in the vernacular is astonishing. At Lahore, in Northern India, which is the capital of the Punjab, there are 14 or 15 daily papers.

The difficulty in casting type for the vernacular languages of India is not insurmountable. While the Urdu, or proper Hindustani, has to be written by professional copyists with reed pens on specially prepared paper and then lithographed on stone and printed in this manner without type, the Hindi offshoot from Sanscrit can be produced from type, as can the various vernacular languages cognate to the original Sanscrit. The Marathi, which is used in parts of the Bombay District, Gujrati, Punjabi, Bengali, Tamil (which is the prevailing tongue in southern India), and other forms of the popular speech in different regions, all differ from Hindustani in that they can be printed from type. Several typefounders who supply the missionary publication houses with the Bible in foreign tongues, of which copies in forty languages and dialects are distributed in Bombay, have adaptations of the Sanscrit characters suitable for most of the printed languages of India. The supposed lack of suitable type does not therefore retard the progress of the printing industry. For reasons not necessary to enter into here the publication of newspapers, pamphlets, and small books in the vernacular languages is certain to go on increasing, and thus to create a demand for presses and the other accessories of printing The point for the manufacturer to know is that, as in other industries of India, the capital available for a plant is not large, and expensive presses are out of the question.

An excellent market for typewriting machines has been established, and is of course controlled by the American manufacturers. Most of the leading machines are represented by local agencies, and the competition among them is very keen. A newcomer into the field would find that no necessity existed for educating the public concerning the advantages of typewriters; but in undertaking to demonstrate the superiority of his own machine he would discover that the ground already had been well covered. Nevertheless, the demand is so constant that a new type of machine, or one new to Bombay, might establish a market if it could demonstrate its superiority in any important particular. The chief native importing and commercial houses generally conduct their correspondence in English and make use of the typewriter for this purpose, as do also the cotton factories.

Cash registers have been slow in coming into favor, and at the present time not more than a dozen are in use in all Bombay, but their introduction at last having been obtained they appear likely to command a fair sale, both the simple and the multiplex register.

The demand for sewing machines is a steady one, but to command a large sale they must come within the means of the great body of consumers and therefore be cheap. For this reason Germany is a strong competitor with Great Britain and sends one-third as many machines as the latter country, though their value is far below one-third the value of the English importations. The total number of sewing machines imported into Western India during the last fiscal year was as follows:—From Great Britain, 5,991; Germany, 2,175; Belgium, 653; United States, 472. Both the Singer and the Wheeler and Wilson companies have Bombay agencies, but the Singer machines are those from the factory in England and their sale does not add to the United States trade.

Electrical installation in Bombay has just begun. Several years ago the Boston capitalists who owned the tramway system proposed the change from horses to electric traction and to provide power for a variety of purposes. A local English official who was strangely opposed to American enterprise succeeded in blocking an agreement with the municipality which would have enabled this to be done. Finally the Americans closed out their interests and the work was undertaken by a British company, which after several years is just getting into shape to supply power. At present not more than 200 electric fans are in use in Bombay, but their number will be largely increased. The business of supplying hotels, bungalows, etc., with small electric plants appears to be in the initial stage.

A proportion of the Indian wheat crop is ground into flour for home consumption. The flour mills are located chiefly in Northern India, which is the grain-growing section of the country. The supremacy of American manufacturers in flour-mill machinery should give them an opening in supplying Indian mills. But, as in every other industry, the limited capital must be understood, and the modest plants not be confused with the great mills of Minneapolis or Rochester.

There is good opening for sawmill machinery, but here too the plants wanted are small ones. A sawmill for India delivered at the dock in New York, free on board, for $300 gold does not appear to indicate a wide market, yet it is the aggregate of these small plants that counts, and the best sale is for plants which can be thus delivered at $300 to $500 gold. The freight and other charges bring the price in India up 10 to 15 per cent. The chief wood of India, which is used for every purpose from hand carving to furniture and house building, is teak wood. This is very hard and heavy, almost equal to iron wood or lignum vitae. It turns the inserted teeth of an ordinary circular saw as if they were tin. Sawmill machinery for India should therefore be made so as to meet this difficulty.

Textile machinery is so largely a monopoly of Great Britain that it can not be said India offers a field in which other manufacturers could compete on even terms. The short staple, very coarse, Indian cotton affords little similarity to the long-staple product of the United States, for which the American manufacturers have been accustomed to provide

machinery. Should what is known as the Spence cotton tree work the revolution in Indian production which is promised for it and demonstrate that an indigenous staple superior to that of the United States exists, new machinery suitable to the long staple would be necessary and the experience of the American manufacturers might enable them to compete with the English. But though very flattering reports of the Spence cotton tree are given and its cultivation is being extended, no great change in the machinery supplied to India in order to gin, spin, and weave the new product is likely in the immediate future. The prosperity of the cotton industry during the last two years has caused the erection of many new mills and the remodeling of old ones, so that India is becoming supplied with the latest improved machinery.

While there does not appear to be much of an opening for American installation of textile machinery, there is a good market for accessories, or what the British call mill stores. Small stationary steam engines for the ginning factories are in demand, and a salesman by means of illustration occasionally might be able to sell a large compound engine. The Indian boiler act is very strict in its requirements and differs essentially from the tests which are imposed in Great Britain or the United States, so that its provisions should be carefully studied.

In steel shaftings, split pulleys, etc., the American manufacturers have been quite successful in satisfying the requirements of the Indian mills and they also have been able to meet the prices quoted by the British manufacturers so that a good trade has been obtained. In belting, however, concessions both as to price and as to methods will be necessary if a foothold is to be obtained and maintained. The Indian market requires that the belting be sold by the pound instead of by running feet, as is done in the United States. The English price is considerably below the American one, and it is claimed that a 300-foot roll bought by pound weight in England, totals one-half less than when bought in the United States. With this discrepancy there is not much chance of extending the American trade until belting is offered by weight, and prices shaded to the English basis.

CHINA AND MANILA STEAMSHIP COMPANY, LTD.

The report of the directors of this company, presented at the 24th ordinary general meeting, held in the office of the general-managers, Messrs. Shewan, Tomes & Co., at Hongkong, recently, is as follows:—

Annexed we beg to submit to shareholders the usual annual statement of accounts for the year ending 31st December, 1906.

The net profit is $27,365.57 which it is proposed to appropriate as follows, viz:—

To place to Reserve Fund	$1,000.00
To pay a dividend of $1 per share	26,000.00
To carry forward to the credit of next year's account	365.57

The S. S. *Rubi* and *Zafiro* ran regularly and very satisfactorily throughout the year, but both passengers and cargo were much scarcer than before. Our gross income shows a very heavy falling off and it has only been by exercising the strictest economy and cutting down expenses that we are able to show a surplus.

Consulting Committee.—Mr. D. E. Brown resigned on leaving the Colony, and Dr. J. W. Noble was invited to take his place on the Consulting Committee. In accordance with the articles of association Messrs. N. A. Siebs, H. P. White, A. V. Apcar and Dr. J. W. Noble retire but offer themselves for re-election.

Auditors.—The accounts have been audited by Messrs. W. H. Potts and A. O'D. Gourdin, the latter having been asked to fill the vacancy caused by the death of Mr. T. Arnold. Messrs. W. H. Potts and A. O'D. Gourdin are recommended for re-election.

Shewan, Tomes & Co.,
General Managers.

PROFIT AND LOSS ACCOUNT.

Consulting committee's fees	$2,250.00
Auditors' fees	400.00
Interest	9,835.03
Charges	668.78
Amount written off as depreciation for 1906	41,027.37
Balance	27,365.57
	$81,546.75
Balance brought forward from 1905	$6,563.45
Exchange	8.88
Profit on working account s. s. *Rubi* and *Zafiro*	74,974.42
	$81,546.75

BALANCE.

Liabilities.

Authorized Capital 30,000 shares @ $25 each $750,000.00	
Issued and fully paid 26,000 shares @ $25 each	$650,000.00
Calls on shares forfeited now belonging to the Company	160.00
Reserve Fund	6,000.00
Underwriting Account	30,976.29
Sundry creditors	28,235.04
Company's Bankers	132,998.60
Balance of profit and loss account	27,365.57
	$875,735.50

Assets.

Value of steamers *Rubi* & *Zafiro*	790,000.00	
Less depreciation	40,000.00	
		$750,000.00
Value of Hongkong buoy and mooring	2,029.85	
Less depreciation	129.85	
		1,900.00
Value of Manila buoy and mooring	6,300.46	
Less depreciation	400.46	
		5,900.00
Value of Amoy buoy and mooring	2,258.50	
Less depreciation	158.50	
		2,100.00
Value of stores on hand	3,738.56	
Less depreciation	338.56	
		3,400.00
Value of coal on hand		4,037.50
Proportion of premium on current policies		24,864.03
Sundry debtors		36,840.74
Outstanding freights 1906		44,430.30
Cash		2,262.93
		$875,735.50

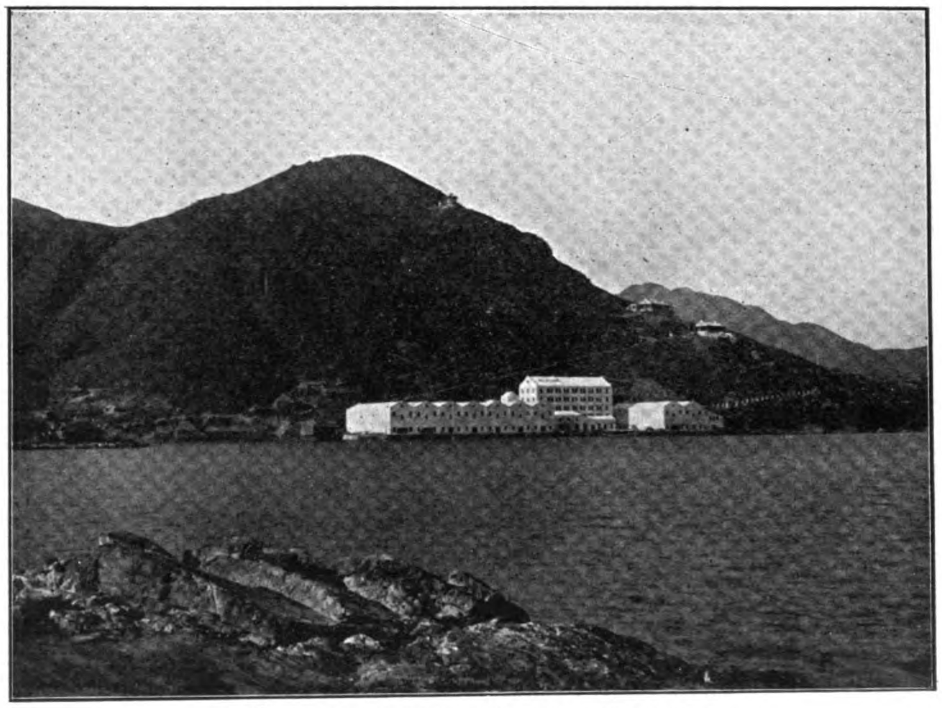
PLANT OF THE HONGKONG MILLING COMPANY, LTD.

The flour mills recently completed at Junk Bay, Hongkong, by the Hongkong Milling Company, Ltd., have been in operation since the first day of the current year. These mills are the first of their kind in South China. They are equipped with the very latest and most improved machinery known to the scientific world for the grinding of flour and have a capacity of 8,000 bags of the product per day. They are conveniently located on the foreshore of Hongkong Harbor for shipping purposes and as they have practically the whole of China as a market for their product the industry seems to have been inaugurated under most favorable conditions. If business comes up to the expectations of the promoters they intend to double the capacity of their manufactory at the end of a year.

An accompanying illustration gives a very good general idea of the mills. The wheat godowns, with a capacity for 1,000,000 bushels of grain, are on the left of the milling building. They were specially constructed to keep the wheat in good order and protect it against the effects of the climate. The flour godowns stand at the left of the main building, and they, too, are a model of what such constructions ought to be. The sloped-roof building abutting on the flour godowns is the bran store, and the buildings to the right on the hillside are the employés' residences, while the engineroom and repair shops are the low buildings directly in front of the mills. The sheds in the extreme right of the picture are the pigsties.

The entire plant is replete with improvements and time-saving inventions. Among the latter is a wire rope and basket arrangement for carrying the bags of wheat from a ship lying off the mills. The most modern motive power is used in the milling operations. Electric fans blow the bran from the mills to the pigsties, a distance of 3,000′, and liquid fuel is fed to engines from a tank on the hillside.

The prime mover in this enterprise is Mr. A. H. Rennie, of Hongkong, whose large experience in the business eminently fits him for the successful conduct of the new company's affairs. Associated with him in the enterprise are Sir Paul Chater and Mr. H. N. Mody. The mills were designed by the well-known architects, Messrs. Leigh and Orange, and their construction were under the supervision of Mr. James Orange, the junior member of the firm.



NEW FLOUR MILLS AT JUNK BAY, HONGKONG

DETAILS AND DESCRIPTION OF THE BURNHAM PLANS FOR THE RECONSTRUCTION OF MANILA

All municipal works under way in Manila at the present time are based as nearly as practicable on the recommendations and plans submitted to the Government, for the future urban development of the city, by Mr. H. H. Burnham, the famous American architect, and now stamped with the approval of the Secretary of War. Mr. Burnham visited Manila in 1905 and made a study of existing conditions. This was when the great movement for making cities beautiful along scientific lines was at its height in America. This movement practically began in Washington in 1901, and in time spread to Harrisburg, Pa., Cleveland, O., Buffalo, N. Y., Ottawa, Ont., St. Louis, Mo., New York City, Detroit, Mich., San Francisco, Colorado Springs, Col., Denver, Col., Honolulu, T. H., Oakland, Cal., St. Paul, Minn., Pittsburgh, Pa., Hartford, Conn., Toronto, Can., Indianapolis, Ind., Springfield, Mass., Springfield, Ill., Helena, Mont., Red Wing, Minn., Portland, Me., and Portland, Ore., and numerous other cities of lesser importance. About the time that Mr. Burnham came to Manila, Mr. Charles Mulford Robinson, another noted architect, was invited to Honolulu on what seemed a preposterous errand, as the architect himself puts it, of planning for the greater beauty of that capital. It turned out that in spite of Honolulu's lovely natural advantages, many pertinent suggestions could be made; and that a student of these matters, coming to the Hawaiian Island as a stranger, was able to point out some simple ways of securing attractive effects that the residents had never thought of. As in the case of Manila, Mr. Robinson's recommendations regarding Honolulu are being carried out.

Mr. Burnham was well qualified to plan for the beautification of Greater Manila. He had been the leading spirit in the architectural design and construction of the World's Fair at Chicago, and later was chairman of the commission chosen by the District of Columbia for the beautification of Washington. He had been called into consultation with other committees on civic improvements, so when he came to Manila it was with a fund of the latest ideas developed by the master minds of experts in America, in addition to his own large knowledge.

Mr. Burnham's Report.—Years may pass ere Mr. Burnham's plan for Greater Manila is fully realized, but once the transformation is complete it is safe to predict that this oriental port will stand out as a model of modern municipal greatness. Although the architect's report was submitted to the Secretary of War in the latter part of the year in which he made his investigations here, his conclusions were not made public in their entirety until about six months ago, when the report and plans were published by the Bureau of Insular Affairs at Washington, under authority from the War Department. It is altogether probable that some features of the original project will have to be modified from time to time as the development progresses, but it is the desire of the Washington Government and the duty of the Municipal Board of Manila to adhere to the Burnham scheme as closely as possible. The report is as follows:—

Historical.—The City of Manila was founded by Miguel López de Legaspi in 1571 and declared capital of the archipelago. After suffering various vicissitudes, including insurrections and attacks by Chinese pirates, the city undertook, in 1590, extensive fortifications, of which part are still standing. An attack by the Dutch in 1602 was successfully beaten off, but the city finally succumbed in 1762 to the English, who occupied the place until the treaty of 1764, by the terms of which the Islands returned to the Spanish crown. The history of Manila is uneventful from 1764 to 1896, the date of an insurrection that cost the lives of many prominent Filipinos, including Dr. José Rizal. This insurrection was still smouldering when Dewey's guns announced the downfall of Spanish sovereignty.

Present conditions, political.—Given over to civil authority in 1901, Manila is governed by a Municipal Board under the authority of the Governor-General and his fellow commissioners, constituting the Government of the Philippine Islands.

Topographical.—Manila lies almost wholly on level ground, the surface of which is only a few feet above mean high tide. From the lake known as Laguna de Bay, the Pasig River winds through the city to the sea, forming, in conjunction with the small drainage streams or *esteros* emptying into it, a group of important waterways on which much freight of the city is moved from place to place.

Building methods.—Most of the existing buildings were erected in Spanish times and are of a distinctly Spanish type. They were for the most part built of wood with projecting second stories; and their screen windows were built of translucent shells set in mesh grille. The roof, which still further overhangs the building, was commonly covered with beautiful dull red tile, and the effect of the whole is unusually pleasing. At the present time corrugated galvanized iron roofs are taking the place of the beautiful Spanish tile, to the serious detriment of the city's appearance. The old Spanish churches and the old Spanish Government buildings are especially interesting, and in view of their beauty and practical suitability to local conditions could be profitably taken as examples of future structures. The general effect of the existing well-shaded narrow streets is picturesque and should be maintained.

Population.—The present population of Manila is given in the report of the Municipal Board for 1903 as 223,029. Owing to the probable active development of industry and agriculture in the near future, the population of Manila may be expected to increase rapidly, and the introduction of surface transportation will ultimately scatter this enlarging population over a greater territory than that inclosed by the present city limits. For the purpose of this report, however, no reference will be made to the territory outside those limits except in connection with parks and parkways, summer resorts and country clubs.

Aim of the proposed plan.—The aim of the proposed plan is to provide:—

Development of waterfront and location of parks and parkways so as to give proper means of recreation to every quarter of the city.

The street system securing direct and easy communication from every part of the city to every other part.

Location of building sites for various activities.

Development of waterways for transportation.

Summer resorts.

Development of Waterfront, Parks, and Parkways.—Manila, like most other towns at certain seasons, is subjected to protracted periods of heat, during which all exertion is accomplished at excessive cost of physical strength. Although these climatic conditions are unchangeable, means of mitigating their effect are unfortunately within reach. Besides the possibility of abundant foliage and fountains of water, Manila possesses the greatest resources for recreation and refreshment in its river and ocean bay. Whatever portions of either have been given up to private use should be reclaimed where possible, and such portions as are still under public control should be developed and forever maintained for the use and enjoyment of the people. The bayfront, from the present Luneta southward, should have a continuous parkway extending in the course of time all the way to Cavite, as shown on the accompanying plan. This boulevard, about 250' in width, with roadways, tramways, bridlepath, rich plantations, and broad sidewalks, should be available for all classes of people in all sorts of conveyances, and so well shaded with palms, bamboo, and mangoes as to furnish protection from the elements at all times. In order to make the boulevard presentable and useful as soon as possible, a quick-growing tree like the acacia might be planted, alternating with the trees of slower growth, and be replaced after the latter retain their growth. The boulevard's seaward side should be planted so as to interrupt occasionally the view of the sea and, by thus adding somewhat of mystery, enhance the value of the stretch of ocean and sky. The boulevard is on made ground about as far south as the Old Fort San Antonio, beyond which it strikes the beach and follows the shore line to Cavite. The possible extension of the ocean boulevard along the north shore will naturally depend upon the development of the town in that direction and upon the question of additional harbor works north of the Pasig.

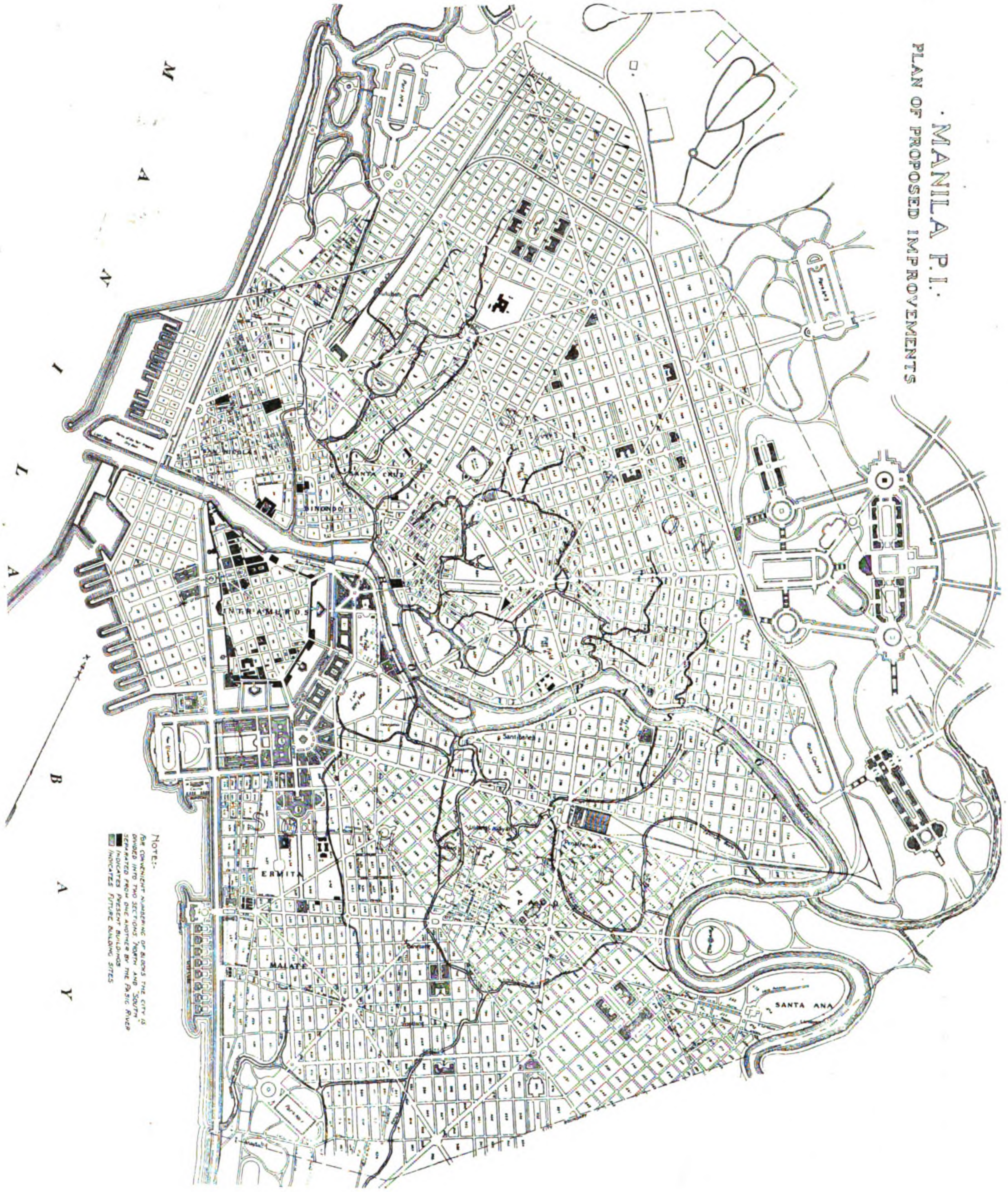
River drive.—The banks of the Pasig should have shaded drives beginning as close to town as possible and continuing up the river, the southbank drive going to Fort McKinley (this road is now open) and beyond this to the lake.

New Luneta.—The present Luneta, being covered by the Government group to be described later, is replaced by a new Luneta of the same size and shape and placed about 1,000' further out in the bay on the new-made land. The objects of carrying the Luneta farther out are to restore its former commanding outlook, partially cut off by the new works of the port, and also to form a large pleasure park near the center of town and on the waterfront. This park, together with the Government Plaza east of it, forms a natural starting point for the bayfront boulevard and its extensions eastward and northward around the Walled City (Intramuros). The level of the new Luneta is slightly below that of the adjoining park, from the balustrades of which the spectator will have a view of the Luneta and a fine prospect over it towards the sea. The existing Luneta plays such an admirable part in the social life of Manila that its advantages should be preserved unchanged. To this end the new Luneta, like the present one, is left without planting of any sort on its westward side so as to give an unobstructed view of the sea. The other three sides are enclosed with a double row of trees in order partially to shut in the Luneta, to provide protection from the sun, and also in order to let the bay be seen from the park through a screen of foliage.

Parks and parkways.—The architects of all periods have recognized the fact that a building, however beautiful in itself, must fail of its highest effect unless provided with an appropriate setting, and in the study of these settings, parks and parking have always played an important part. The older cities of the world present numberless examples of the value of open spaces used to dignify important buildings, and in the arrangement of the proposed plan of Manila the most noteworthy examples have been frankly followed. Park spaces, small in extent, in the shape of plazas, circles, esplanades, park boulevards, have been laid out so that in any quarter of the city future buildings of importance may find already prepared for them a location susceptible of adequate treatment in its approaches and surroundings. The small square at one side of Calle Real, facing the present Manila (English) Club, is an example of what can be done to beautify a city by very modest means. Although it is both impossible and undesirable to fix at present the location of many future buildings, the adoption of a street system containing many definite sites especially adapted to organic grouping of buildings will encourage the location of future buildings at such spots; and this fact should induce the owners of real estate to lend their support to a plan in which generous use of parking will enhance the desirability of neighboring property.

If the use of the parks as an architectural accessory has long been common, it has remained for the modern city, with its immense and congested population, to show the necessity of them as breathing places for the people. These parks are oftenest of two types—playfields of moderate size in the heart of the city and large sylvan stretches located in the outskirts, where more ample areas permit the laying out of beautiful walks and drives in the middle of a romantic landscape.

Playfields.—Among the examples of the playground type are the 14 parks recently created by the South Park Board of Chicago. Averaging from four to 80 acres in area, these parks are destined to form veritable neighborhood


MANILA P.I.
PLAN OF PROPOSED IMPROVEMENTS
MANILA BAY
INTRAMUROS
SANTA CRUZ
BINONDO
ERMITA
MALATE
PACO
SANTA ANA
NOTE:-

club grounds for the use of the people. Each park povides facilities for the larger outdoor games, running track, separate outdoor gymnasia for men and women, large open-air swimming basins, swings, sand boxes, and wading pools for children. Each park has a club building, containing a large hall for public entertainments, in addition to reading rooms, indoor gymnasia, baths for men and women, and small swimming pools.

The value of these wholesome resorts in the center of a densely populated city can not be overestimated. Experience has shown that they almost entirely eliminate certain classes of crimes, and that their general effect is a marked improvement in the moral tone of the neighborhood. The new plan of Manila shows nine such parks, evenly distributed over the city. However wide the actual final location of certain of them may vary from the position shown on the plan, the principle of equal spacing over all city districts should be adhered to.

Informal parks.—Large parks, of which the location at a certain distance from the center of population does not interfere with their usefulness, will be chosen with especial regard to the landscape possibilities. Attractive stretches of water and ground of varying contours present the greatest resources. With regard to varying contours, the only spot where the uniform dead-level characteristic of Manila gives way to changes of elevation is northward of the city, from Santa Mesa toward the bay. On this higher ground at least one of the outer parks should be located (see park No. 3 on plan). With regard to parks determined by the use of water, three locations are suggested—one north of the city in the low ground about the Vitas Channel; another south of the city, where the Estero de San Antonio enters the bay, and a third east of the city, in the narrow bend of the Pasig, near Santa Ana. In the absence of contour maps and detailed information, however, regarding real estate conditions, no final design of parks could be attempted, and the parks sketched on the plan are intended merely as suggestions.

These parks are all made accessible from one another by parkway boulevards, so as to permit a continuous journey entirely around the city from park to park without losing at any point the refreshment of green foliage. Each park is furthermore made accessible from all city centers by boulevards as shown. To appreciate the value of these encircling parkways one has only to visit any French city of even moderate size. The exterior boulevard, wide and well-shaded, is seldom lacking. In crossing such a city one can often conveniently leave a narrow and ill-favored street and, without loss of time, enjoy a journey of some distance along a well-shaded parkway before again plunging into a less attractive quarter.

Fountains.—Whatever the value of parks and parking, their greatest charm and power of refreshment are only attainable in connection with flowing water. So clearly was the value of flowing water recognized in Rome that Emperor and Pope through the centuries have alike done their part in the creation of the fountains for which the city is so justly famous. Wherever one goes in Rome the gentle spray of water is ready to refresh the eye and the ear. Rome has seen many catastrophies, involving the destruction of public works, but the great gravity aqueducts still bring in their flowing water for the refreshment of the heat-ridden city. In Manila, it is hoped, in due time the same wide use of playing fountains will help mitigate the trying effects of a tropical climate.

STREET SYSTEMS.—The aim of the plan to realize ideal conditions in the unbuilt quarter of town must be seriously modified in the old built-up quarter, where the existing streets, bridges, and harborworks can not be ignored. In the proposed plan the general street arrangement is left substantially unchanged, and no demolition of buildings or changes in the direction of the streets are suggested, except such as seem imperatively called for to relieve present congestion and provide for the future needs of traffic. Should such changes appear excessive, two facts must always be borne in mind: First, that any plan worth the making is necessarily proportioned to future rather than present requirements; second, that the execution of a plan including laying down of street lines and preliminary purchase of available real estate must be begun early, even though left long incomplete, in order to avoid prohibitive future cost, due to rise in real estate values and the construction of costly improvements across the line of proposed streets. This immediate beginning is especially important at Manila, where the evils of congestion are even now manifest, where real estate values, though considerable, are only nominal compared with those of other cities, and where the existing buildings are for the most part cheap and poor in character. Every year's delay adds to the difficulty and cost of modifying the old street system; and if Manila is in future days to possess the qualities of beauty and convenience appropriate for the capital of a great nation, the present is the moment to take the initial steps, in order that time, with its inevitable changes, may aid the work rather than oppose it.

The first step consists in establishing the new street lines and purchasing such real estate as can be acquired without damage to property interests. It will probably be found that certain streets can be in this way entirely opened up at once. In certain other cases property interests would only allow the opening of a street in sections here and there. The completion of the work by removal of the remaining buildings can be left, as is done in Paris, for half a century, if necessary, until such time as public safety calls for their demolition, or until the owners on their own initiative decide to rebuild in accordance with the altered street lines. In this way a street once begun will tend to complete itself with increasing rapidity by the cooperation of the property owners themselves. A small present outlay will assure the ultimate completion of the improvement.

Old walls.—Certain of the old walls surrounding the Intramuros have been in existence since the end of the Sixteenth Century. Viewed as one of the few remaining examples of a mediæval fortified town, they possess singular historical and archæological interest, while their imposing appearance gives them great monumental value. The objections to their presence are based on alleged obstructions of traffic and ventilation. As obstacles to the free circulation of air, their moderate height compared with adjacent buildings seems to make them comparatively unobjectionable. With regard to their disadvantages as obstacles to traffic, their method of construction with massise corner bastions, making possible the piercing of an occasional gateway without destroying their effect, seems on this score also to leave them open to no serious objection. The new street openings should be cut through the massive projecting bastions at the angles of the Intramuros. These bastions being the nearest points to the Bagumbayan Drive, furnish the most available points for a roadway across the sunken lawns formed by filling the moats. Furthermore, an opening through these masses of masonry will be in a sense masked by the thickness of the walls, the entire opening not being visible to any spectator except one placed directly opposite the opening. Even wide openings at these points will still leave two masses so great as to constitute suitable flanking motives for a great gateway. Openings at other points than the corners will, on the contrary, cut through thin curtain walls, which are unsuited for adequate treatment as gateways except by the addition of a mass of architectural elements foreign to the simple and massive character of the walls themselves. The detached redoubts are left at the center of the sunken panels as isolated monuments. The old Camp Wallace bastion, which should be preserved for the sake of its historical interest, is supposed to be taken down and rebuilt between the old wall and the Malecón Drive at a point not far from the line of Calle Anda.

The moats.—The existing moat, necessarily stagnant, is open to such serious objections on both sanitary and æsthetic grounds that its elimination seems unavoidable. It should be filled up (this has been done since the rendition of this report) and the counterscarp which it incloses should be leveled off, so as to form sunken panels simply treated as a greensward without planting. This sunken garden will form useful playfields, and serve as a proper setting for the old walls, whose apparent height can be enhanced by establishing the level of the sunken lawn as far below the neighboring streets as proper drainage will allow. The tops of the walls, made accessible to pedestrians and planted with overhanging stone pines, after the matter of the beautiful inclosures of the Japanese castle in Tokyo, will become attractive lounging places, and seen from below across the stretches of open lawn will add a unique touch to the monumental aspect of the town.

Street system in the new quarter.—In the outer districts of the city, where no approved street system exists, and where no approved property stands in the way of a *de novo* arrangement, a street system is provided in accordance with the following principles:—

Avoidance of either north and south or east and west orientation of building sites.

Fan-shaped grouping of radiating streets.

Diagonal arteries, allowing direct communication from any city district to any other.

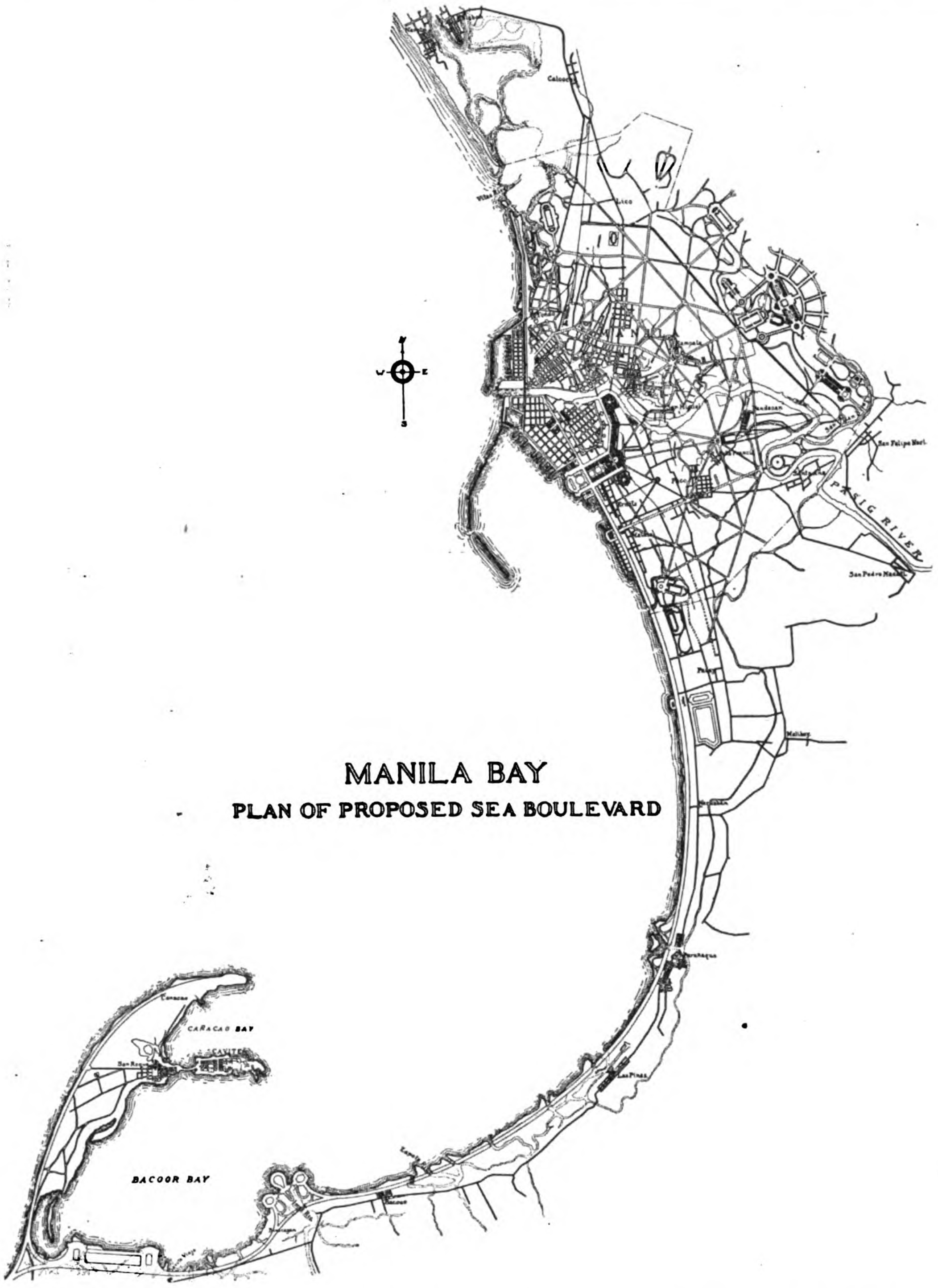
The avoiding of north and south or east and west orientation of streets allows each of the four sides of the house to have the advantage of direct sunlight at some time during the day, with consequent gain in ventilation and sanitation.

The radial street scheme divides the town into five sections, of which the center is constituted by the existing Intramuros and its adjacent territory. In each section the rectangular system prevails, one set of streets taking a direction toward the town center, the other set being at right angles to this direction, the general effect of the whole arrangement being a fan-shaped system radiating from the center and a tangential system skirting the inner city in a general circular direction. The reason of this arrangement is the fact that from any given point in the outer section of the city the volume of traffic toward the center will exceed the volume of traffic toward any other single point. Hence the advantage of a system which directs half the streets of a given quarter directly toward the busy center. The city most nearly suggesting this fan-shaped system is modern Athens.

The practical convenience of a rectangular street system for a small town needs no argument, but its extension over a large area means that a person desiring to cross town in a diagonal direction is subjected to a serious loss of time and waste of energy in *tacking* to the right and left to reach his destination. In a large city like Chicago this unnecessary waste of time means enormous annual money loss, and in case of fires may contribute to great disasters. Speaking generally, the planning of a town should be so carried out that a person may pass from any given point to any other point along a reasonably direct line. This has been accomplished in the proposed plan, somewhat as at Washington, D. C. —the best planned of all modern cities—by superposing a system of wide diagonal arteries on the rectangular system above described. These arteries, with the radial ones springing from the center, all of them being wider than the average street, permit parklike connections with space for trolley cars, reaching all important centers of the city.

Width of streets.—The avoidance of excessive cost of filling and the securing of protection from the sun call for streets as narrow as the needs of the traffic will allow. Such wider arteries as seem indispensable for each circulation should be well planted to provide ample shade, and in the wider avenues forming park connections the cost of filling can be reduced and the effect of the avenue enhanced by treating the center as a sunken lawn.

Summary; street system.—The aim of the proposed street system of Manila is, in brief, to leave the old city streets untouched except, for the creation of a few indispensable new arteries upon which work should be begun immediately. The old walls, left undisturbed except for street openings through the angle bastions, should have a setting formed by a sunken garden replacing the unsanitary moats.



MANILA BAY
PLAN OF PROPOSED SEA BOULEVARD

In the outer part of the town a rectangular street system insures sunlight on all sides of the houses, provides especially ample streets in the line of heaviest traffic toward the town center, and by means of radial and diagonal arteries makes every section of town readily accessible from every other.

In considering this street system, we should bear in mind that the presence of water very near the surface places almost prohibitive difficulties in the way of depressed or underground connections of any sort. So that, short of a recourse to expensive and objectionable track elevation, there is only one way to provide for ample traffic, *viz*, by sufficient street arteries. If any one fear that the plan as indicated goes beyond the probable needs of Manila, let him remember the foresight of Washington and L'Enfant, who planned a capital city of 800,000 souls for a country whose entire population was about 4,000,000.

LOCATION OF BUILDING SITES.—Among building groups the first in importance, the Government or national group, which would include capitol building and department buildings, is located on the present Camp Wallace and the adjacent land back of Calle Nozaleda. Grouping itself closely about the capitol building at the center, it forms a hollow square, opening out westward toward the sea. The gain in dignity by grouping these buildings in a single formal mass has dictated this arrangement, the beauty and convenience of which has been put to the test in notable examples from the days of Old Rome to the Louvre and Versailles of modern times. The entrance court on the town side is here referred to.

The eastern front of the Capitol group faces a semicircular plaza, from whose center radiates a street system communicating with all sections of the city—an arrangement entirely fitting for both practical and sentimental reasons; practical, because the center of governmental activity should be readily accessible from all sides; sentimental, because every section of the capital city should look with deference toward the symbol of the nation's power. The plaza allows space at its center for a national monument of compact plan and simple silhouette.

Hall of Justice.—The court-house or Hall of Justice is given a separate location south of the main group and heading the vista down the avenue which passes the east front of the Capitol. The practice, too common in the United States, of grouping Courthouse and Postoffice in one building, while convenient and economical from the point of view of Federal administration, is in other respects unfitting. The Postoffice is a business machine affecting public interests. Its character, consonant with its practical necessities, is commercial. The Hall of Justice, on the contrary, far from being solely a business machine, represents sentimentally and practically the highest function of civilized society. Upon the authority of law depend the lives and property of all citizens, and the buildings which constitute the visible expression of law, its symbol of dignity and power, should be given the utmost beauty in their location, arrangement, architectural treatment, and approaches. A Hall of Justice should be treated as a thing apart, a thing majestic, venerable, and sacred. It should above all be free from the clatter of commerce, and in its architectural expression should speak the greatness of its function. The moral effect of such a Hall of Justice, magnificent in outward form and aspect, compelling an attitude of respect, if not inspiring a feeling of awe, would be cheaply secured at large sacrifices of space and money.

Library, museum, exposition buildings.—Stretching from the Government group northward along Malecón Drive toward the Bridge of Spain are spaces for a number of semipublic buildings, such as libraries, museums, and permanent exposition building. The termination of this group forms a central circle, from which radiates the three most used bridges over the Pasig. The lines of Malecón Drive have been changed in order to reduce the street scheme to an orderly arrangement running parallel with the old walls and with them forming a consistent architectural composition. The Malecón Drive has also been widened to 250', so as to form the continuation of the ocean boulevard.

It is fortunate that the existing buildings in this quarter, municipal building, barracks, First Reserve Hospital, and others, are so located and of such a character as to afford no serious obstacle to carrying out the improvement The value of the athletic fields near the town center is recognized by placing back of the libraries and museums two fields to replace the existing Camp Wallace playground.

Postoffice.—The Postoffice, requiring frontage on the river for easy water transportation of mails, is located south of its present temporary site. If possible, the river bank should be left unobstructed here as elsewhere, and water approach provided by means of slips. This central location with converging avenues will make the building readily accessible from all sides.

Railway station.—One of the arteries radiating from the Government center leads directly to the proposed passenger railway station, centrally located, with reference to Greater Manila, between Paco and Pandacan. This station, which is one of the two vestibules of the city—the port being the other—thus stands in reciprocal relation to the administrative and governmental center. The station is furthermore connected by its own system of radiating arteries with all quarters of the city. This location was determined by the double advantage of being near the heart of Greater Manila and of occupying a bend in the Pasig River such that the necessarily extensive development of the terminal property (for car storage, roundhouses, coalyards, cleaning yards, etc.) could take place with less cutting of traffic than at any other location, the river at this point furnishing a natural barrier that in any case would be crossed by infrequent bridges.

Railway approaches.—The railroad approach to the passenger station is over a bridge south of Santa Mesa Heights. The future southern lines will enter the station over this bridge, after previously crossing a second bridge from the south side of the Pasig. This does not necessarily involve trouble for the southern lines, since the northern lines will in any event need a bridge connection with the southern lines outside of the city limits, the Manila & Dagupan Railway having in fact already secured a right of way for such connection. On the other hand, to bring the southern lines to the station by a lateral approach inside city limits, and without crossing the Pasig, will interpose a serious barrier to the growth of Manila southward and eastward. The avoidance of such

an obstacle should not in any event be prevented by the cost of a railway bridge. And an additional bridge is not a serious hindrance to navigation in a city where many bridges are inevitable.

The existing railway line to Antipolo puts between Manila and its valuable high ground near Santa Mesa a barrier that should, if possible, be minimized at some future time by converting the line to a suburban electric road and by securing a railroad outlet farther from the town center.

Municipal group.—The Municipal group, more important than any other except the Government group and the Hall of Justice, is supposed to include the Ayuntamiento and to be grouped around Plaza McKinley. The plaza might be enlarged by adding the block upon which the unfinished Spanish building stands. The plaza thus opened out to the Malecón Drive connects with a second plaza on the new-made ground, facing the proposed Customhouse, Board of Trade, Commercial Museum, and other semipublic buildings, and forming an impressive composition. The Customhouse so located would be in convenient relation to the port and the city. The axis of the Municipal group continues clear to the waterfront, where a special pier with enlarged approaches and suitable accessories will lend itself to treatment in accord with this function as the principal water gate of Manila. The water gate, like the railway plaza, needs ample space for handling crowds of spectators and massing troops in connection with such public ceremonial as take place from time to time at the entrance of a great capital.

Official residences.—In the belief that the bay front, with its boulevards and parks, is the natural theater of the social life of Manila, the residence of the Governor-General is located in the bay outside of the boulevard on the new-made land facing an esplanade cut through the existing Malate military reservation. Fronting the residence of the Governor-General and facing one another on opposite sides of this esplanade are the houses of the Major-General commanding the Division of the Philippines and the Vice-Admiral of the station. From this esplanade, the center of official life, radiating arteries reach out to all sections of the city.

Social clubs.—Stretching south from the Governor-General's residence, also on new-made land, extend a series of city clubs, whose character as semipublic institutions justifies giving up to them a portion of the waterfront. Each club will have ample grounds for gardens and outdoor games, as well as a broad terrace on the seaward side with suitable planting for protection from the sun's glare and the typhoon. It is believed that the close grouping of these clubs, as in London, will enhance their value to the whole community. The concentration of social activities through the related grouping of official residences, hotels, and clubs in parkway boulevards and gardens along the waterfront will, it is believed, make possible an attractive social life that will bring many influential people to Manila and count for much in the prosperity f the islands. The delightfulness of a city is an element of first importance to its prosperity, for those who make fortunes will stay and others come if the attractions are strong enough, and the money thus kept at home added to that freely spent by visitors will be enough to insure continuous good times. The aim should be to make Manila, really, *The Pearl of the Orient.* Along the shore, beyond the city limits to the south, is shown a suitable location for a country club, the main club buildings being located inside the ocean boulevard, but with space reserved for certain buildings on new-made land between the boulevard and the sea.

New Hotel.—To the north of the Luneta park is a space approximately 500×600′ reserved for a hotel whose size, surroundings, and appointments are intended to deliver Manila once for all from the standing reproach of inhospitality toward a traveler. A hotel on a sufficient scale in this location could be made renowned the world over and constitute in itself alone an attraction strong enough to draw to Manila every traveler in the Orient. With three sides fronting on parks and boulevards, and the fourth side fronting the sea, the hotel site offers every possibility for a world-famous resort.

Casino, public baths, boat clubs.—Opposite the hotel site and south of the park provision has been made, on a space 300×600′, for small boat clubs, a casino, and public baths. The suitability of this point for bathing facilities will depend on the formation of a beach by silting of the sand against the new retaining wall.

School center.—A group of schools forming perhaps a university, would be well placed on Santa Mesa Heights, having the advantages of proper detachment from the city, good air, high ground, and available water for aquatic sports.

Charitable institutions.—The high ground north and east of the city is also well adapted for parks as well as hospitals, sanatoria, asylums, and other semipublic institutions demanding a quiet location conveniently accessible from the city. While no such groups can be designed at present, the plan shows the kind of arrangement that could be used to advantage on this exceptionally favorable ground, and provides for an improvement that will be inevitable in the course of time.

DEVELOPMENT OF WATER TRANSPORTATION.—The new port work with its necessary railroad facilities, demands a railroad approach from either the south or the north side of the river. The railroad already exists on the north side and its continuation to reach the new-made land can be accomplished by bridging the Pasig near its mouth. On the other hand, a railway approaching the harbor from the south side of the town would cut through the city in such a way as to destroy real-estate values and also be a constant source of danger unless the tracks were elevated. But the expense of track elevation is clearly prohibitive for a long time to come. The lesser evil is, therefore, a railway drawbridge over the Pasig. Such a bridge across the mouth of a stream running at certain times at 10 knots an hour constitutes, in the opinion of experts, a serious hindrance to navigation, and will materially reduce the value of the river frontage above the drawbridge. This frontage, limited by the Bridge of Spain, is already unequal to the existing demands, and will call for extension in the near future.

The additional wharfage, if found in the new port, would be far from the present business district in San Nicolás and Binondo, so that unless business should consent to move south of the river, an additional harbor north of the river seems inevitable. Such a harbor entered from the present 18′ channel, is shown on the plans in close relationship with the business and railway freight district. This harbor of moderate depth for coastwise steamers lends itself to indefinite extension northward at comparatively small expense, the area of valuable reclaimed land being considerable in proportion to the cost of retaining walls built in shallow water. There is little doubt that private corporations, in the absence of Government initiative, would be glad to undertake such improvements in exchange for privileges in connection with the new-made land.

Esteros.—The narrow canals or *esteros* ramifying throughout Manila, with their almost stagnant water and their unsanitary mud banks, would appear at first sight to be undesirable adjuncts of the city. Yet for tansportation purposes they are of the utmost value, and in spite of the serious problems involved in properly widening, bridging, and maintaining them they should be preserved. In the coast cities of the Orient *esteros* are numerous, and it is a long-fixed habit of the people to transport goods upon them, their availability for the poorest boatman making them peculiarly valuable. To develop the full usefulness of the system, certain of the *esteros* should be filled up and the others widened and dredged to a practical depth; all of them should be provided with masonry banks. So treated they will offer an economical and unobjectionable means of freight handling that will greatly contribute to the prosperity of the city.

A complete development of the *estero* system would comport an *estero* connection, as suggested by Major James F. Case, between the Pasig River and the Vitas Channel, while an amplification of the *estero* system connected with the Pasig River near Santa Ana, and opening into the bay through the San Antonio *estero*, might serve by its independent channels materially to diminish the danger of overflow of the Pasig.

The *estero*, it should be remembered, is not only an economical vehicle for the transaction of public business; it can become, as in Venice, an element of beauty. Both beauty and convenience dictate a very liberal policy toward the development of these valuable waterways.

River banks.—In addition to creating on the river banks a continuous shaded drive in the outer districts, every effort should be made to establish an open quay along both river banks in the business parts of the town in order that river steamers may make the frequent landings demanded by the public service. Large manufacturing houses can serve their own interests without inconvenience to the public by building river slips or branches of the *estero* system on their own ground, as suggested for the proposed new postoffice The river banks should be everywhere available for the use of the public.

SUMMER RESORTS.—The climate of Manila seems to call for the establishment of accessible summer resorts on high ground, and however useful Baguio may be as a health resort, no town a hundred miles or more from Manila can entirely take the place of comfortable resorts within easier reach of the capital. The low hills near Manila on the east, the higher mountains of Mariveles across the bay, the hill country surrounding Laguna de Bay, all offer possible locations for summer resorts within easy range of the city and furnishing change of air for the families of government employees without the drawback of family separation and great cost of transportation.

FUTURE BUILDING METHODS.—The first consideration in determining architectural style is the question of adaptability to local conditions. In any given locality the things already existing as a result of long experience are likely to prove the best. In Manila this general rule seems to apply with especial force.

Overhanging second stories.—The wooden houses with overhanging second stories and continuous window screens are convenient, practical, and artistically admirable. Owing to the difficulty of locating telegraph and telephone poles in the narrow streets bordered by houses with overhanging second stories, the municipal board of Manila has recently adopted the policy of prohibiting the further construction of projecting second stories in narrow streets. In view of the pleasing effect and adaptability to the climate of this characteristic style of construction, its suppression is regrettable. Some other method of supporting electric wires—perhaps from the housetops—might be devised in order that a desirable method of building may not be discontinued.

Tile roofs.—The beautiful roofs of Spanish tile are also rapidly losing ground before the invasion of galvanized iron. While the cheapness of the iron roof recommends its use for temporary service, there is no doubt that for permanent buildings the long-lived Spanish tile will prove more economical. And an examination of some of the very old tile roofs of Manila leads to the conviction that the alleged dangers of tile roofing, in an earthquake country, have been greatly exaggerated. In the matter of tile roofing, as in other building matters, the Spanish traditions are deserving of acceptance.

Masonry construction.—In a tropical climate costly structures put up with granite, marble, or other building stones, in the manner of public buildings in Europe and America, would be out of place. Flat walls, simply built of concrete (with steel reenforcing rods to resist earthquakes), and depending for their effect upon beautiful proportions rather than upon costly materials, are from all points of view most desirable for Manila. The old Spanish buildings with their relatively small openings, their wide-arched arcades, and large wall spaces of flat whitewash, possess endless charm, and as types of good architecture for tropical service, could hardly be improved upon. To mention a few examples in Manila: The Ayuntamiento, the Intendencia, the Cathedral, the tower of Santa Cruz, the circular cemetery on calle Nozaleda, and the inner court of the present constabulary barracks at Parañaque are especially noteworthy.

CONCLUSION.—The above description of the existing conditions with suggestions as to their most obvious possibilities, shows that improve-

ments of great scope are attainable in Manila by reasonable means. On the point of rapid growth, yet still small in area, possessing the bay of Naples, the winding river of Paris, and the canals of Venice, Manila has before it an opportunity unique in history of modern times, the opportunity to create a unified city equal to the greatest of the Western world, with unparalleled and priceless addition of a tropical setting.

In keeping pace with the national development and in working persistently and consciously toward an organic plan in which the visible orderly grouping of its parts one to another will secure their mutual support and enchantment, Manila may rightly hope to become the adequate expression of the destiny of the Filipino people as well as an enduring witness to the efficient services of America in the Philippine Islands.

HONGKONG AND WHAMPOA DOCK COMPANY, LTD.

The ordinary yearly meeting of shareholders in the Hongkong and Whampoa Dock Company, Ltd., was held in the offices of the company, Queen's Buildings, Hongkong, recently, and the report of the directors and the statement of accounts to December 31st, 1906, were received. There were present Sir Paul Chater (chairman), the Hon. Mr. W. J. Gresson, Messrs. E. Goetz, A. Haupt, G. H. Medhurst, N. A. Siebs, S. Silverstone, J. S. Van Buren, D. W. Craddock, and H. P. White (directors); W. Wilson (acting chief manager), T. I. Rose (secretary); R. J. Audap, J. P. Braga, G. de Champeaux, Chau Siu Ki, Choa Leep Chee, Capt. W. E. Clarke, Messrs. Albert Denison, F. E. Ellis, E. Georg, Ho Fook, W. C. Jack, E. J. May, S. H. Michael, S. J. Michael, E. J. Moses, W. Parlane, Thomas Skinner, H. Percy Smith, W. H. Wickham, and A. G. Wood.

CHAIRMAN'S ADDRESS.—The chairman's address was as follows:—"The report and statement of accounts having been in your hands for some days, I will, with your permission, take them as read. The net profits for the half year ending December 31st, 1906, amount to $369,596.36 as compared with $403,256.44 for the first six months of the year, and $171,649.83 for the corresponding period of 1905. To this sum must be added the sum of $392,087.38, the balance brought forward from last account, and after deducting directors' and auditors' fees we have available for appropriation the sum of $750,933.74, which sum your directors propose, subject to your approval, to deal with as follows:—To pay a dividend for the half-year of 12 per cent or $6 per share absorbing $300,000, to place $50,000 to the credit of a special account to be called 'No. 1 Dock Extension Account,' and to carry forward the balance $400,933.74 to a new account. Appropriations which will, your directors trust, meet the wishes of the shareholders. While in view of the disastrous typhoons which occurred in September last, and the vast amount of the work for the company resulting therefrom, it may at first sight appear that our earnings for the past six months are somewhat less than might have reasonably been expected, it must be borne in mind that the whole of this work has not yet been completed and consequently the period now under review does not reap the full benefit thereof, several large repairing jobs remain yet to be done and the profits arising therefrom will come into the accounts for the current six months, and while on this subject it may be interesting to you to learn to what extent we ourselves suffered by these same typhoons. I am pleased to state that the amount of damage done to your property was comparatively slight, approximating in all only some $53,800. Two of our launches were submerged; they have since been raised and fully repaired at a cost of $9200 which sum has been passed to the debit of marine insurance %. The caissons, sea-walls, wharves, buildings, etc., at our three establishments sustained damage to the extent of about $44,600, of which $27,132 has already been paid for repairs executed and passed to the debit of working %., leaving $17,468 to be expended during the current six months; taking into consideration the tremendous havoc wrought by the blow of September 18th, throughout the colony, but more particularly on the Kowloon side, I think it is a matter for congratulation that we escaped without sustaining far heavier damage. The tonnage of British and foreign men-of-war docked during the past six months shows a decrease of 73,500 tons, a falling off largely attributable to the arrival in the Philippines of the floating dock, not a single American vessel having come to us for docking since then. On the other hand, the tonnage of merchant vessels shows an increase over the previous six months of some 10,098 tons, the tonnage docked since 1st July being for this class of vessel 466,369 tons. While we have not been engaged in the construction of any large vessels lately a glance at our report will show that we have not been idle in the building yard, quite a number of small craft having been turned out and others are now nearing completion; this work together with the repairs to the numerous vessels damaged in September last has kept us fully employed for months past. Towage and dredger %s.—You will be pleased to see once more on the right side of the accounts. The value of 'materials on hand' is about the same as in the last account, while work in progress shows an increase of about $82,000. The purchase of the land at Kowloon referred to at our private meeting in August last is completed, and we have now under consideration tenders for the work of removing the hill and lengthening the No. 1 Dock. We propose carrying on this work with our own staff, and, as I have already mentioned, recommend passing the first sum of $50,000 to an account specially to defray the cost of this undertaking and we hope to be able to carry it through without making any call upon shareholders for increased capital. Before moving the adoption of the report and accounts I shall be pleased to answer to the best of my ability any question you may wish to ask."

MR. WOOD'S REMARKS—Mr. A. G. Wood, in seconding, said—"I have much pleasure in seconding this resolution, which must, I think, be considered satisfactory. It is also satisfactory to learn that we suffered comparatively so little loss from last September's typhoon, while there is still an amount of work in hand arising from that calamity. I am sure that our shareholders have heard with pleasure what you have told us about the dock extension now being taken in hand. Many may perhaps agree with me in regretting that we are at the commencement of the work instead of at its completion; we would have then been in so much better a position to meet the increased competition we have to expect. I understand that Sir Paul Chater is vacating the chair which he has occupied for four years. So I ask you to join me in thanking him for the valuable services, he, with the assistance of his colleagues, has rendered to the company, and in hoping that his successor's labours in the chair will continue to promote its success. I do not know that I can suggest a more efficient spur than by pointing to the fact that at this time last year our shares were quoted at $163 and now they are at $140. I have much pleasure in seconding the motion.

The report and accounts were adopted unanimously.

Mr. Georg moved that the appointment of the Hon. Mr. W. J. Gresson and Mr. D. W. Craddock to the directorate be confirmed.

Mr. A Denison seconded and the motion was carried.

Captain Clarke moved the re-election of Mr. N. A. Siebs and the Hon. Mr. W. J. Gresson.

Mr. Jack seconded and the motion was adopted.

Mr. Parlane moved the re-appointment of Messrs. H. U. Jeffries and H. Percy Smith as auditors.

Mr. Ho Fook seconded and the motion was adopted.

The Chairman—Dividend warrants will be ready to-morrow. Thank you for your presencee. The meeting then ended.

OIL FIELDS OF SAGHALIEN

There is no doubt in the minds of Oriental experts that Saghalien will, in the near future, take an important place in the production of coal and oil for the markets of the Far East. As most of the mineral bearing regions fall to the lot of Russia in the delimitation of the island almost completed by the international commissioners, Japan loses a source of enormous wealth, the anticipation of which doubtless had much to do with her almost universal dissatisfaction over the terms of peace. The coal deposits of Japan itself are of vast extent, but the quality of all so far produced is not that of a first-class fuel; and the oil-fields of the country, though being fast pushed to the limit of development, are yet unable to supply the home demand, and the deficiency has hitherto been met by importation from the Baku fields, and those of the United States.

The Saghalien coal beds were opened as far back as 1858, but as the work has been carried on by means of convict labour, the least productive of all industrial activities, the development has been extremely sluggish and generally unsatisfactory. An incompetent and irresponsible administration has naturally resulted in a ruthless waste of time and product. Some of the big seams set on fire by rebel convicts thirty years ago, are still smouldering. Most of the hard-labour convicts are not properly under the control of their masters, and many of those toiling in the mines by day, spend their nights plundering the neighbourhood, and are able to "make it all right" with their guards in the morning.

The most important coal-producing districts are along the west coast of the island the chief centres of operation are at Due and Vladimirsk. Seams of the mineral have also been seen exposed along the banks of the river Tim. Most of the Saghalien deposits are near the surface, and the coal is mined with but little difficulty. The convicts simply approach the coal on the level and tunnel into it, and thus they go on until, finding themselves inconveniently situated, they abandon the spot but half exploited, and turn to a more tempting place. Today the Vladimirsk region looks like a vast rabbit warren. Yet the output equals about two-and a half million tons annually.

All the coal so far found in Saghalien has proved to be of a most excellent lignite quality, on the whole far superior to Japanese coal and commanding a much higher price. The convicts are supposed to have 10 per cent. of the value of the output divided among them as wages, and the coal sells at from -Y-5 to -Y-6 a ton on board.

Facilities for transportation and lading, however, are of the most primitive and inadequate kind, entailing great uncertainty in the fulfilment of contracts, and seriously diminishing their number. The greatest difficulty is in the absence of any safe anchorage for ships, made doubly dangerous by the extreme fickleness of the weather. If a high wind should arise, as it frequently does, all loading operations have to be suspended, and the vessel must put to sea or be driven upon the rocky coast.

Happily a scheme is now on foot, and doubtless will be carried into effect, for the building of a mole from Jonquiere Head to the *Three Brothers* rocks, which will afford a much needed shelter for shipping. Also, a railway is being laid from the mines to Alexandrovsk, the chief town and port of the north, and when these improvements are completed, the process of lading will be more simple, regular, and dependable, and the coal can be delivered at a more reasonable rate.

The present method of coaling a ship presents a scene more absurdly slow and antiquated than can be seen anywhere else in the world. Twenty-five convicts have been known to take a whole day to put on board as many tons. Another ship could get but 2,000 tons into her bunkers in three weeks. Such conditions as these have so far kept Saghalien as a competitor out of the coal markets of the Orient; but the material is there, and no more than brains and capital are required to make the island one of the most profitable and satisfactory of coal-producing lands.

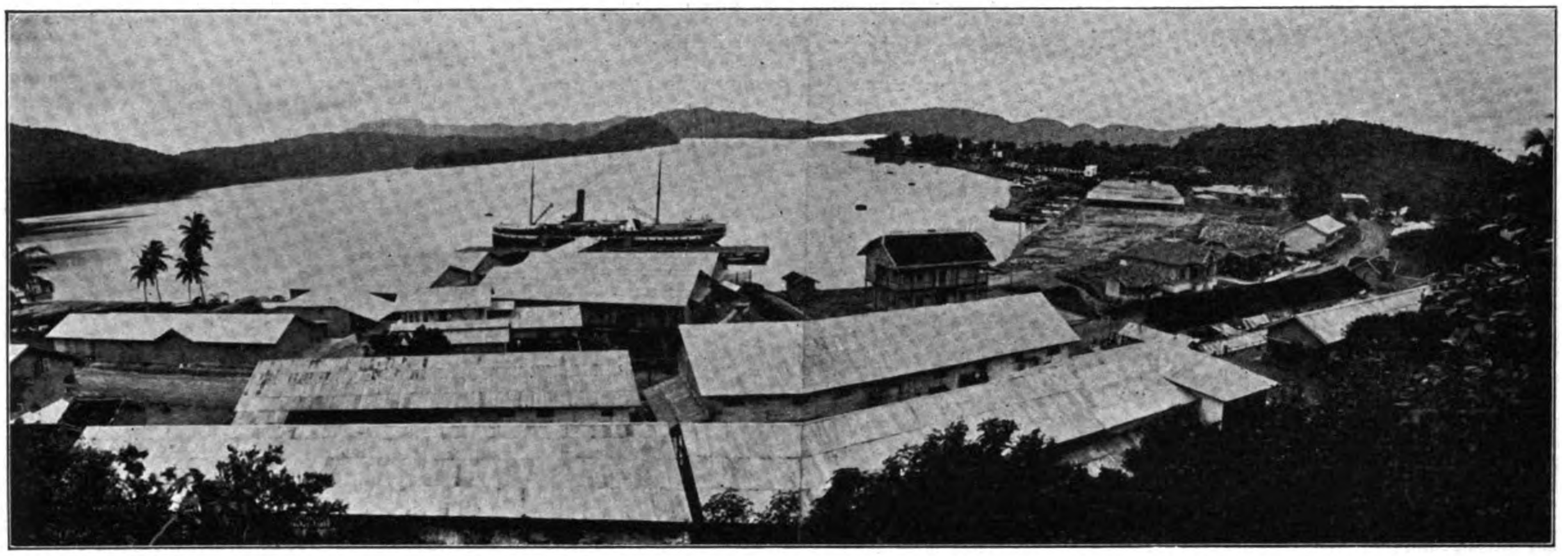
The oil-fields of Saghalien are believed to

(Continued on page 329.)

Coal Industry of the Sabang Bay Harbor and Coal Company, Island of Pulo Weh

In view of the interest which has of late been manifested by steamship owners in the growing port of Sabang Bay, North Sumatra, some reliable data, both historical and commercial, with regard to this harbor, the trade expansion of which can best be described as phenomenal, will no doubt be of value.

Up to about 1893, Sabang Bay, and indeed the Island of Pulo Weh, in which the harbor is situated, was inhabited by only a small number of natives. In this year the advantages of Sabang as a base for the numerous Dutch gun-boats, etc., then occupied in subduing the Achinese, became recognized, and with this in view a workshop fitted for ordinary repairs to steamers was erected, and a Government floating dock with a lifting capacity of 3,000 tons was installed, and is in use at the present time. It is only, however, within the last five or six years that the remarkable situation of Sabang as a port of trans-shipment for the rapidly-growing trade of the northern part of Sumatra, and as a coaling port for steamers proceeding through the Straits of Malacca, has been fully appreciated.



GENERAL VIEW OF THE PORT OF SABANG, UNDER CONTROL OF THE SABANG BAY HARBOR AND COAL COMPANY

UNDER PRIVATE CONTROL.—From the inception of its commerce, the Port of Sabang has been under the control of a private concern. The Sabang Bay Harbor and Coal Company, which, under the immediate auspices of the Netherlands Trading Society, has shown commendable energy in pushing the fortunes of its undertaking. When it is said that this private company has had to build the entire stretch of magnificent wharves which now line a large part of the bay, from its own funds without Government subsidy, it will be seen that those most intimately interested have been possessed of ample faith in the future of their venture.

As a coaling port, the geographical position of Sabang could not be more advantageous. Lying exactly in the track of all vessels proceeding to or returning from the Far East, either *via* the Suez Canal, or the Cape of Good Hope, it represents almost precisely the half-way station between Port Said (or Durban) and the coal ports of Japan, and during the southwest monsoon a further advantage accrues to Sabang, since steamers bunkering there can take the southern route across the Indian Ocean, thus avoiding the full strength of the monsoon. That these advantages are appreciated the growth in the coal trade of Sabang, which in 1902 only amounted to 23,000 tons, advancing in 1905 to nearly 100,000 tons and in 1906 to more than 120,000 tons, is confirmed in no uncertain manner.

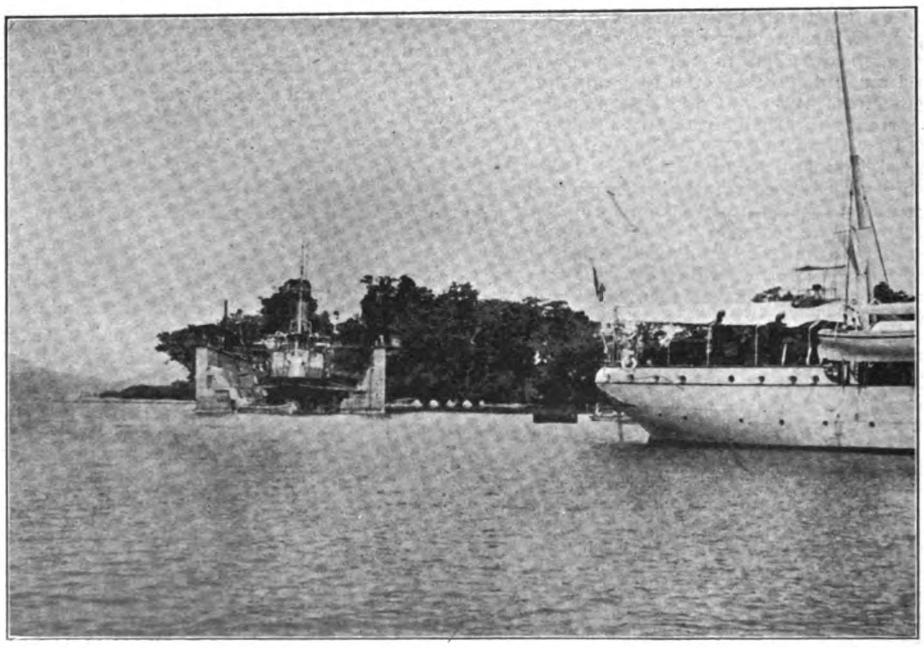
COAL SUPPLY AND COST.—In addition to the advantageous geographical position of Sabang, it must also be recognized that these results are the consequence also of the rapid despatch and the moderate price at which coal can be sold there. These advantages are obtained from the extensive use of labor-saving apparatus, the company having installed a plant consisting of four electric transporters, each weighing 120 tons. These transporters run on rails all along the numerous coalsheds, which are now 24 in number, and when discharging a cargo, iron buckets containing 25 hundredweight of coal are filled in the holds of the colliers, thence lifted and carried by travellers above the sheds from which points they are lowered through hatches and automatically capsized upon touching the coal heap. In this manner any rough handling of the coal is effectively obviated.

In the reverse operation of bunkering, buckets are also used wherever possible, but owing to the construction of steamers it frequently happens that part, at any rate, of the coal must be placed on board with baskets. In such cases the baskets are filled in the sheds and carried on board by the travellers where they are deposited in the most suitable spot for the completion of the operation by the force of coolies employed by the company.

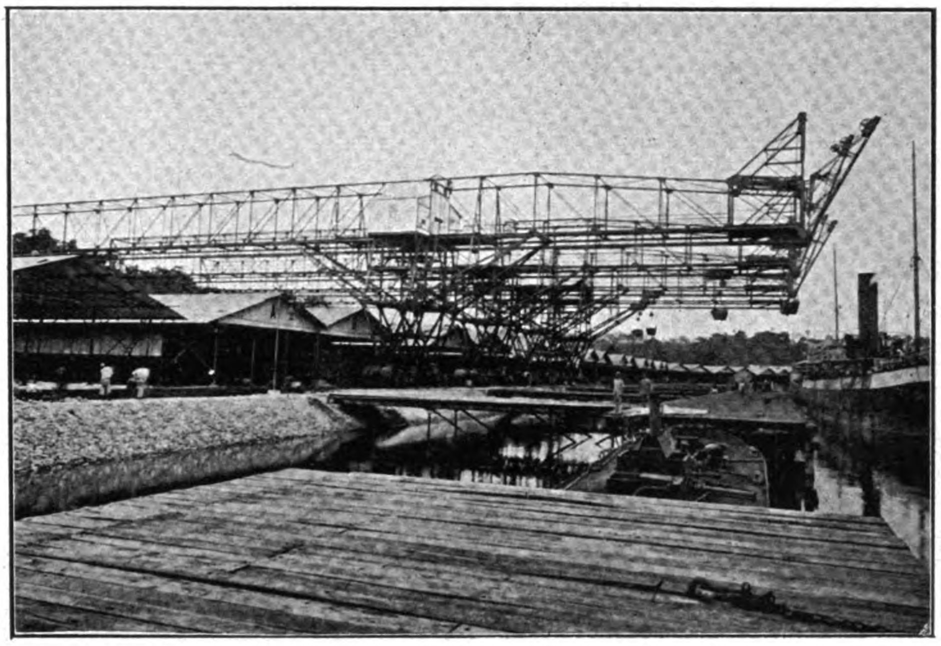
These transports have now been in use for more than two years, during which time they have worked to the satisfaction of the company, and also to the satisfaction of the steamship owners using the port, who have benefited by the quick despatch obtained. The company is to be congratulated upon its enterprise and forethought in installing machinery, which, although involving a large expenditure of money, is undoubtedly doing its part in advancing the general interests of the port. Another reason for the popularity of Sabang as a coaling station is that the company has from the first made no charge for harbor dues, pilotage, etc., on steamers calling for bunkers, all such charges being invariably included in the prices quoted for coal. This absence of charges involves also a complete absence of many of the formalities and petty delays so irksome to captains and owners.

The descriptions of coal principally supplied at Sabang are Bengal and Sumatra (Ombilin), in addition to which, however, stocks are also kept of the best Cardiff and Japanese production.

GENERAL COMMERCE.—From the standpoint of general commerce, Sabang may claim to be rapidly becoming the principal trans-shipment port for the exports and imports of the northern part of Sumatra, the trade of which is expanding by leaps and bounds. To provide for this trade, the Sabang company has established godowns for the storage of merchandise, covering an area of 45,000 square feet. The imports consist chiefly of European goods discharged from the mail steamers of the Netherland Steamship Company, which are trans-shipped on board the local steamers of the Royal Dutch Packet Company, which, together with some Chinese-owned coasters under the British flag,



FLOATING DOCK AT SABANG BAY



BUNKERING PLANT AT SABANG BAY

also afford regular communication with Penang and Singapore.

Since the middle of last year the two Dutch mail lines, the Netherland and Rotterdamsche Lloyd, have started a regular joint service of cargo boats, running between Java and Calcutta, and calling at Sabang and Rangoon. The Asiatic Steamship Company, which already supplied a regular service between Java and British India, thereupon also included Sabang in their itinerary, and besides large quantities of Bengal coal, both companies are importing Burmah rice for local consumption in Acheen, and for trans-shipment, chiefly to Deli.

The most important exports consist of Deli tobacco, nearly one-half of the crop, representing a value of about $8,000,000 gold, being shipped at Sabang in the mail steamers and cargo boats of both of the Dutch lines; the balance still takes the longer route *via* Batavia, Singapore or Penang, at which two latter ports it is loaded by the Holt liners and Norddeutscher Lloyd. Another North Sumatra product, Acheen pepper, which hitherto was exclusively exported *via* the Straits, is also beginning to take the shorter way, *via* Sabang.

COASTING TRADE.—As a trans-shipment port it may be expected that Sabang will benefit from the liberal measure recently adopted by the Dutch Government, according to which coasting trade between Sabang and other Netherland Indian ports is allowed to foreign vessels. Whereas in a general way the coasting trade within the Dutch colonies is reserved to the national flag, foreign steamers now enjoy exactly the same rights as Dutch steamers for the trade between Sabang and all other Dutch ports, and *vice versa*.

In regard to general merchandise, as in the case of bunkers, the Sabang company makes inclusive charges in the form of wharfage on goods which cover the entire expenses of a steamer touching at the port for the trans-shipment of merchandise. Thus free from import duties with their annexed impediments of custom-houses, formalities, and officialdom, without any *bar* either natural or physical which could prevent vessels of all nations from availing themselves of its facilities, Sabang, pushed for all it is worth by a private company, may reasonably expect to continue its natural growth as an international coaling station and trans-shipment port. As long as the Dutch Government follows the same liberal policy as in the past and takes the necessary measures to defend the neutrality of the port in time of war, the growth of Sabang can only be welcomed by merchants and shipowners, as well as by their respective Governments.

OIL FIELDS OF SAGHALIEN

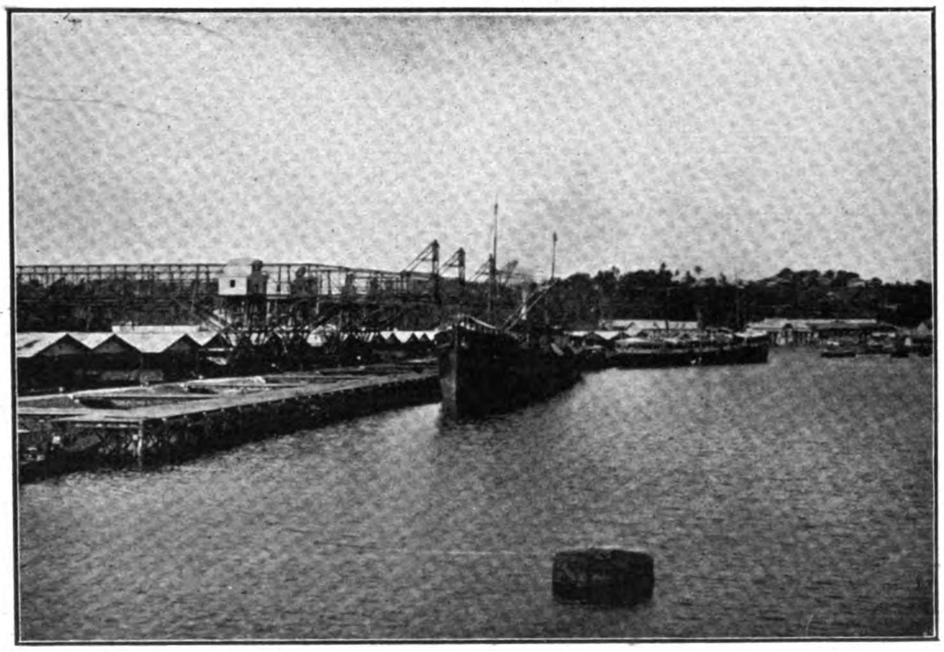
(*Concluded from page 327.*)

be even more extensive than the coal deposits. The existence of petroleum on the island was known to the natives long before it was reported to the Russian Government by an expert in 1894, in which year he discovered rich exusions of it near the Boatassin river. Proceeding a few miles further north, near the river Nutovo, he came upon whole lakes of the precious liquid. One of these lakes, which had a diameter of about eighteen feet, was actually in a state of bubbling upheaval. The other had a hardened surface of bituminous mud due to the evaporation of the oil, and with sufficient resistence to permit walking on it. Some prospectors boring at a point four miles north of the Boatassin river found nearly 30 feet of solidly frozen ground, which in many cases has proved a difficulty.

M. Platonoy, a Russian petroleum expert, sent out by the Baku Manufacturers' Trust, after visiting the Pennsylvania and Texas oil-fields, reached Saghalien in 1893, and upon completing a careful examination of the most promising districts, gave out a very optimistic opinion of the wealth and extent of the Saghalien fields. He even went so far as to state that all he had seen in America was as nothing compared to that which he had seen in Saghalien. M. Platonoy does not hesitate to assert that the petroleum deposits along the Nutuvo river are in all respects superior to those in the Baku region. A quality greatly in favour of the Saghalien oil is that it contains no benzine, and is, therefore, capable of immediate use as fuel. Assiduous efforts are now being put forth by private companies to bring the product of this region upon the market, and the thousands in China and Japan now dependent for their oil supply on Southern Russia and the United States, anxiously await results.

There are, however, some formidable obstacles to be overcome before there can be any profitable development of regions so remote as the oil-fields of Saghalien. Prospecting there at present is at the greatest personal discomfort and at the gravest risk of life itself. The fields are more than three hundred miles from the nearest Russian penal settlement, and the prospector is in constant danger of being murdered by the brodyagi (escaped convicts) that prowl in considerable numbers through those northern wilds, ready to stop at nothing that promises relief to the pangs of hunger. All the workmen employed at the "wells" are themselves convicts, every man of whom has killed a fellow mortal at some time or other in his career, and who could not hesitate to do it again if there was anything to be made out of it. Notwithstanding the danger, numerous prospectors are to be found there, young fellows from England and America, and other countries; and they say that when the *brodyagi* appear, their only safe plan is to shut all the workmen inside the camp, and face the enemy with rifles and revolvers until he is either dead or driven off.

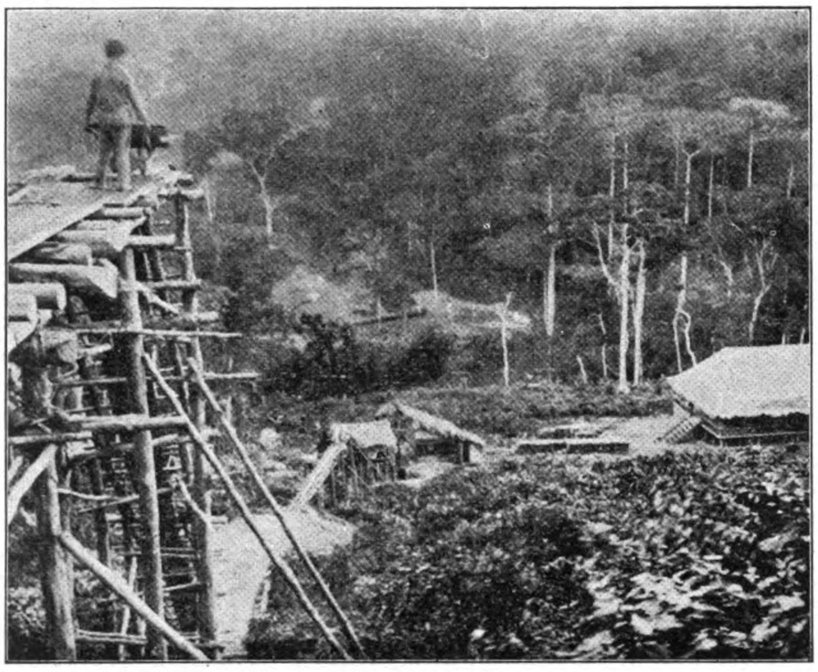
During the winter months the cold is so extreme as to be 40° below zero most of the time, and then all operations have to cease. The usual plan of the prospector is to try to get down to Alexandrovsk before the rivers freeze over. One party had got many miles on the way down, when the frost overtook them, completely closing navigation and compelling them to undertake a dreary journey through impenetrable forests back again to the camp. On their way back they came across a hut in which were found six skeletons reclining in various positions, reminding them of the fate of others passing through that region.



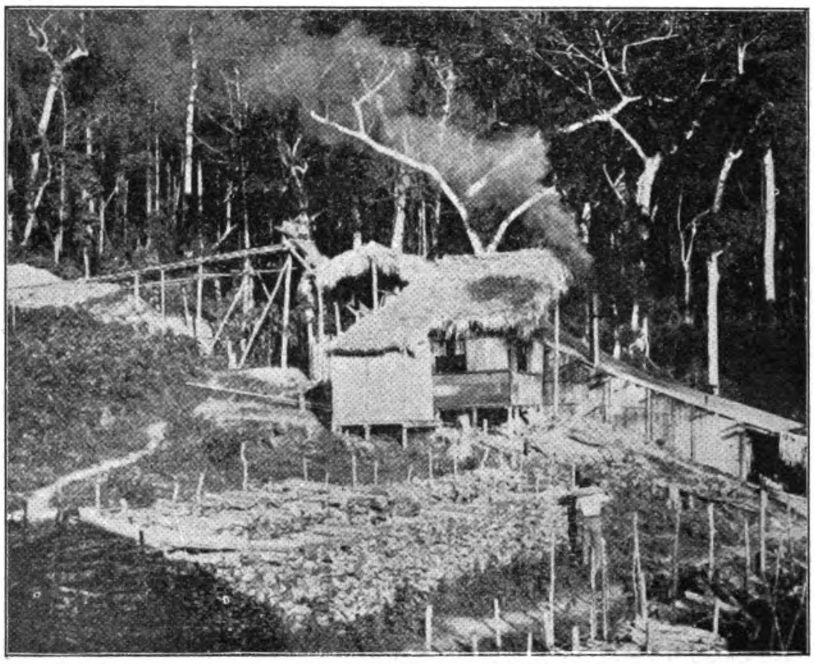
ANOTHER VIEW OF THE COALING PLANT AT SABANG BAY, SHOWING WHARVES

EASTERN MINING COMPANY'S MASBATE WORKINGS

(By A. J. Eveland, *Mining Engineer.*)



BIRD'S-EYE VIEW OF EASTERN MINING COMPANY'S CAMP



VIEW OF THE MILL FROM VERANDA OF OFFICE BUILDING

The Aroroy Mining District, on the northastern coast of the island of Masbate, has been probably the most prominent of the mineral areas under exploration since American occupation of the Philippine Islands. The Eastern Mining Company was one of the pioneers in the Philippine field and has been the most prominent concern of the Aroroy region. Its property comprises seventeen lode claims of the following names and sizes:

Name.	*Area.*
King	22.9568 acres.
Have Got (fraction)	21.5889 "
Nebraska Star	22.9568 "
Holy Moses	22.5310 "
Elise	22.5968 "
Sweetheart	22.5968 "
Mabel (fraction)	22.9005 "
Nancy (fraction)	22.8163 "
Mountain Maid	22.9568 "
Can Do (fraction)	6.0067 "
Never Sweat (fraction)	10.9381 "
Doris (fraction)	12.7339 "
El Dinero	22.5 Appx."
El Oro	22.5 " "
Alice	22.5 " "
Jessie (fraction)	20.0 " "
Katherine (fraction)	2.5 " "

The holders of the first twelve claims named above organized in 1901, and incorporated in 1903, the Eastern Mining Co., of which the Officers are at present as follows:

President - - - - - - - - - A. Heise.
Vice-Presdt. and Sec. - - - Geo. Morgan.
Treasurer - - - - - - - - - Gay H. Parsons.
Directors. - - - - - - - A. Heise. C. H. Parsons. T. D. Aitken. W. J. Shaw. B. H. Berkengotter. T. M. Devilbliss.

The total area of the property is about 340 acres, all of which has been surveyed, and the first twelve claims named—240 acres in area, are in process of patenting, all the papers having been filed.

The claims are situated on the Guinobatan River, about four miles from the village of Aroroy, which is on the northeast coast of the Island of Masbate.

The Island is, in latitude, centrally situated in the Philippine group, and reached by steamer from Manila, in about 24 hours' run. Aroroy is a village of a few houses, a school, and a post office, of no particular importance except as the port for the mineral region known by the same name. The village is on the south shore of the Porto Barrera, a wide bay which extends almost to the other side of the island. South of the village, on the hills back of the town, is the mineral region, extending to the southeast to a distance not yet known—present operations are confined to the region along the Lanan and Guinabatan rivers, both of which discharge into the Porto Barrera.

Aroroy is the port of call for only one or two steamers, and the direct calls do not average more than two a month. Masbate, however, about thirty miles down the east coast, is the largest and most important town on the Island, and the seat of local government, and here better than weekly calls obtain. From Manila to Aroroy, a distance of 250 miles, the time of passage is from 24 to 40 hours, 30 hours being about the average, tho' bad weather may delay the small steamers to a considerable extent. Masbate is practically the same distance from Manila in point of time. There is a weekly mail service between Masbate and Aroroy, and a gasoline launch is available at Masbate, or at Aroroy, upon notice, for passengers or a few tons of freight.

Quicker passage may sometimes be obtained by going to Sorsogon from Masbate, and catching one of the almost daily steamers from there to Manila, or the reverse trip.

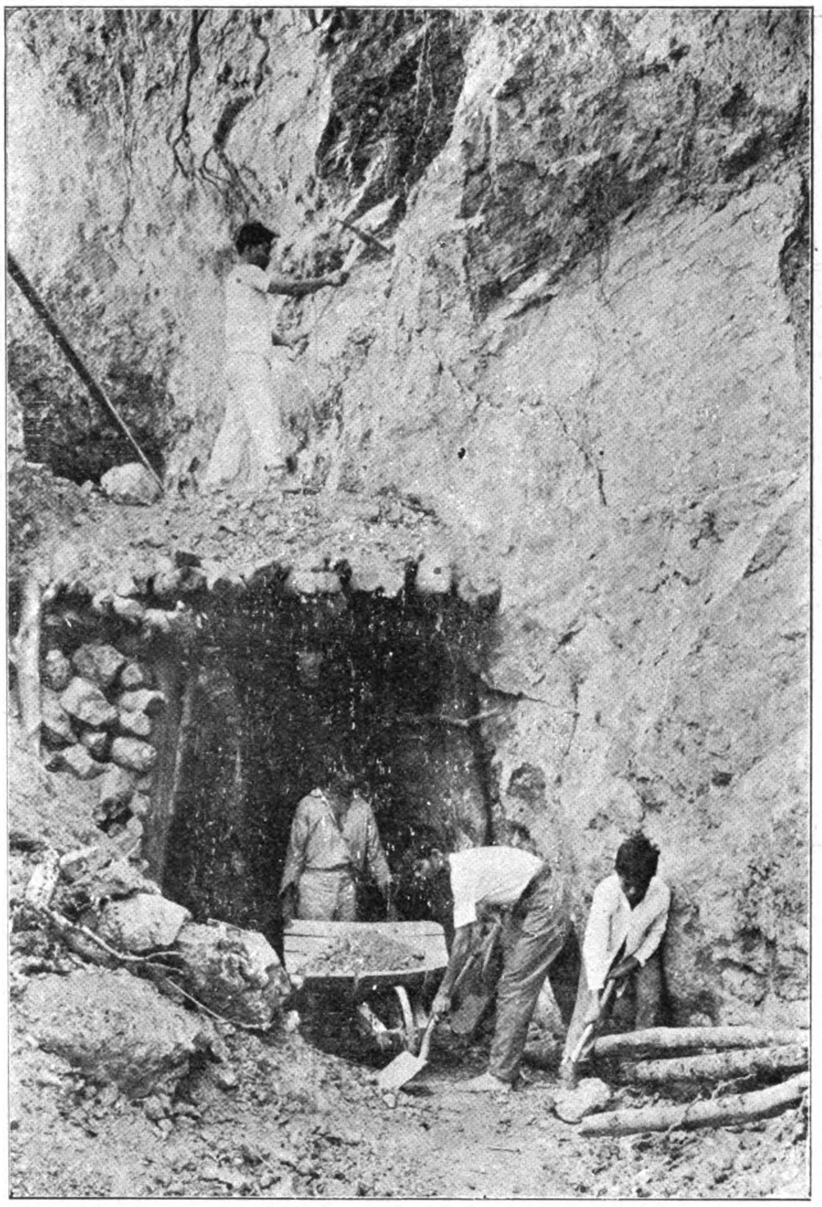
From Aroroy to the Eastern property, there is a horse trail in very poor condition over the first three miles, until the Giunabatan river is reached. For the remaining distance of not more than two miles, the trail follows the river and is in good shape. Over this portion of the trail, a wagon road is being built, which will extend from the Eastern Mining Company's property down the river to the head of tide water on the Guinabatan River. The lower 2 miles of this road has been completed at a very low figure and on its completion, freight may be brought via water around on the Guinabatan River, up to the first camp, which marks the head of the light navigation, and there landed, at a considerably less expense, and in less time, than as now, landing at Aroroy. Cascos can be loaded from the ship's side and can transfer their freight direct to the wharf on the wagon road.

Freight charges are extremely variable—from the best information that could be gathered, the rates from Manila to Aroroy will average four to ten pesos ($2 to $5) U. S. Currency, depending, as usually is the case with water transportation, on the character of the mater ia space occupied, and weight.

From Aroroy to the mine, all freight is at present packed on carabao at the rate of 0.90 pesos ($0.45 U. S. Currency) per trip. As much as 350 or even 400 pounds may be carried, if not too bulky. From the Guinabatan river landing the rate for carabao packing is 60 cents ($0.30 U. S. Currency) per trip, and at this rate, assuming as an average a three hundred pound pack, the freight rate after leaving the steamer is excessive—six pesos ($3.00 U. S. Currency) per ton from Aroroy to the camp of the Eastern Mining Co., or four pesos ($2.00 U. S. Currency) from the Guinabatan River landing to the camp. The decreased cost in making the landing at the Guinabatan river, during the next year, when large amounts of supplies are coming in, and three mills being erected, will pay for the construction of the wagon road proposed.

Topographically there is nothing either unusual or noteworthy in this region. On account of an unusual rainfall, natural valley erosion has developed on a slightly elevated island mass a system of drainage which gives quite a decided relief to the region, and to the island as a whole. There is a considerable area of lowland flanking the bay, and this is almost entirely open cogon grass land, rolling hills, gentle slopes and with an elevation not exceeding 100 feet. Mount Bagadilla, on the north side of the river, only a thousand feet or so in height, and other ridges and spurs of generally less than that elevation, are typical of the "highland" area, which adjoins the rolling country. Only occasional is an eminence of over six or seven hundred feet—five hundred feet would more nearly represent the average elevation of the highlands. The claims of the Eastern Mining Co., with the exception of the "Mountain Maid" and "Never Sweat," lie on the south side of the Guinabatan, on the north and south sides of a ridge about five hundred feet in elevation, which owes its existence to the quartz leads that form its backbone and have aided in resisting destruction. The ridge has enough height to give several hundred feet of "backs" above the level of milling and has sufficient slopes to facilitate any tram or ropeway construction as well as suitable slopes at mill sides. Drainage takes place rapidly, and is well cut, so that control of the run off is easy.

Road construction will not be attended with any difficulty; there will be no heavy cuts or fills, and bridge work will be small in amount, if care is made in location. Altho' not great, stream profiles, of main streams at least, are sufficient to make easy the construc-



OPEN CUT AND TUNNEL

tion of flumes or ditches, in case more water is desired from distant points.

The island of Masbate represents an igneous basal mass which has recently, geologically, passed through some interesting phases. The island has been submerged, at least once, to a depth of some hundreds of feet, and coal beds have formed on the southern end. Remnants of limestone, formed in Miocene times, cap hills in the vicinity of Aroroy, and their nature indicates formation at considerable depth. During the rise of the island, it is evident that several pauses took place resulting in the formation of beaches, which may be seen on the northside of Porto Barrera, not at a considerable elevation. An intrusion of a very large granite mass, of which Mount Villon is a portion, took place at some uncertain age, and probably was the principal cause of the origin of the ore deposits. There also has been, in a time more recent since the formation of the limestone in the Miocene, lava flows of different kinds, both extrusive, over the surface and in dykes through the basal dioritic mass. Probably these, in common with other districts of the Philippines, were partially, at least, a cause of the formation of ore bodies. The latter are more than twenty-five veins, forming a system probably all of more or less connected type, running thru' the basal diorite, of every width, from a few feet to over a hundred; they maintain a very striking regularity for several miles.

Locally, the ground of the Eastern Mining Co. has the longest dimension of its 330 acres parallel and covering the strikes of a number of these veins, at least fifteen.

There is an excellent stand of native hard and soft wood on these seventeen claims. The timber is of the first quality, and a large proportion of it comes under the "1st Group" in the classification of the Forestry Bureau. Nara, Molave, Apitong, Tamayuan, Toog, Amiguis, and other woods occur in abundance, of first class growth, where they can be dropped within a few feet of the place to be used. These woods have been used underground and in mill and other building construction, and have given satisfaction. There is enough of a stand on the claims to satisfy all wants for some years, and in the immediate vicinity are forests still untouched by the axe. Native labor at 25 cents U. S. Currency per day gets out this timber very cheaply, and sawyers (native) cut it to dimensions at the rate of 10 cents per vara (33 inches), for the usual log sizes up to 18 inches. For 18-25 inch logs, the price is 15 cents (gold) per vara.

Molave can be contracted for at $17\frac{1}{2}$ cents per cu. foot, squared, but even at this low figure, is in excess of day's pay work by timbermen.

There will be no excessive timbering in the ground, however. The walls of the veins so far opened up are firm and stand well.

Fire wood can be delivered on the ground for $2.00 per cord, and there is an abundance of swamp wood of excellent quality.

Owing to customs duties and distance involved in the importation of supplies into Manila, prices are somewhat higher than in the United States. Manila has grown a great deal in the last few years, commercially, and there are large and well stocked firms doing business there. Except for special mining machinery, it is not necessary to go further than Manila to obtain all materials that are needed, and at prices not unreasonable.

The native has been used in this and other mining districts, extensively and successfully, both in surface and underground work. His efficiency is naturally not as great as that of the white man, and yet, when the daily wage and the amount of work done are taken into consideration, it is found that results are excellent. Supervision must be thorough, and the treatment of the men must be more or less paternal. The scale of wage agreed upon to be used through the districts is as follows:

Common labor, not to exceed..................	$0.30 U. S.	Currency	per	day.
Underground labor, not to exceed $0.50 to......	0.30	"	"	"
Timbermen Carpenters, etc.. not to exceed.....	0.75	"	"	"

With these prices it is understood that the focd of the laborer is provided free of cost by the employer. It consists of 3 "chupas" (about $2\frac{1}{4}$ lbs). of rice and three small fish per day, the whole worth about $.05 to $.07 U. S. Currency. At this wage the Filipino will produce work enough to invite comparison with the results obtained by using more expensive labor. For example, a double hand drill crew of two men, mucking their own direct, will drive a 7×5 ft. drift on an average of 45 ft. per month, or $1\frac{1}{2}$ ft. per day, at a total cost of labor of less than $1.25, or about $0.80 per foot. With proper supervision by white foremen, Filipino crews will be able to make at least 80% headway of any other labor.

As yet, all work underground has been by day's pay, and no data are available for the results or prospects of contract work. In other districts where I have seen it tried, success has been met with, and I see no reason why the very small spark of ambition the Filipino possesses might not be encouraged to the benefit of himself and the operator. Contracts are entered into now for the supply of firewood, timber, and transportation from the coast, and results have been satisfactory.

For all but skilled technical positions, it will be found that Filipinos can be used—they can be trained as drillmen, timbermen, millmen, machinists and firemen, and the only thing needful is supervision by a white man as foreman in each branch of the work.

The supply of labor in Masbate should be sufficient—the island is well populated, and there is only a limited amount of agriculture or other industry to draw them away. Effort should be made to provide suitable homes for the men, and it has been found that if laborers can be induced to settle at the camp with their families, they are much more content. The Eastern Mining Co. has provided homes, a cock-pit, a well equipped store which supplies goods at prices equal to the native "tienda," and has obtained good results from this policy.

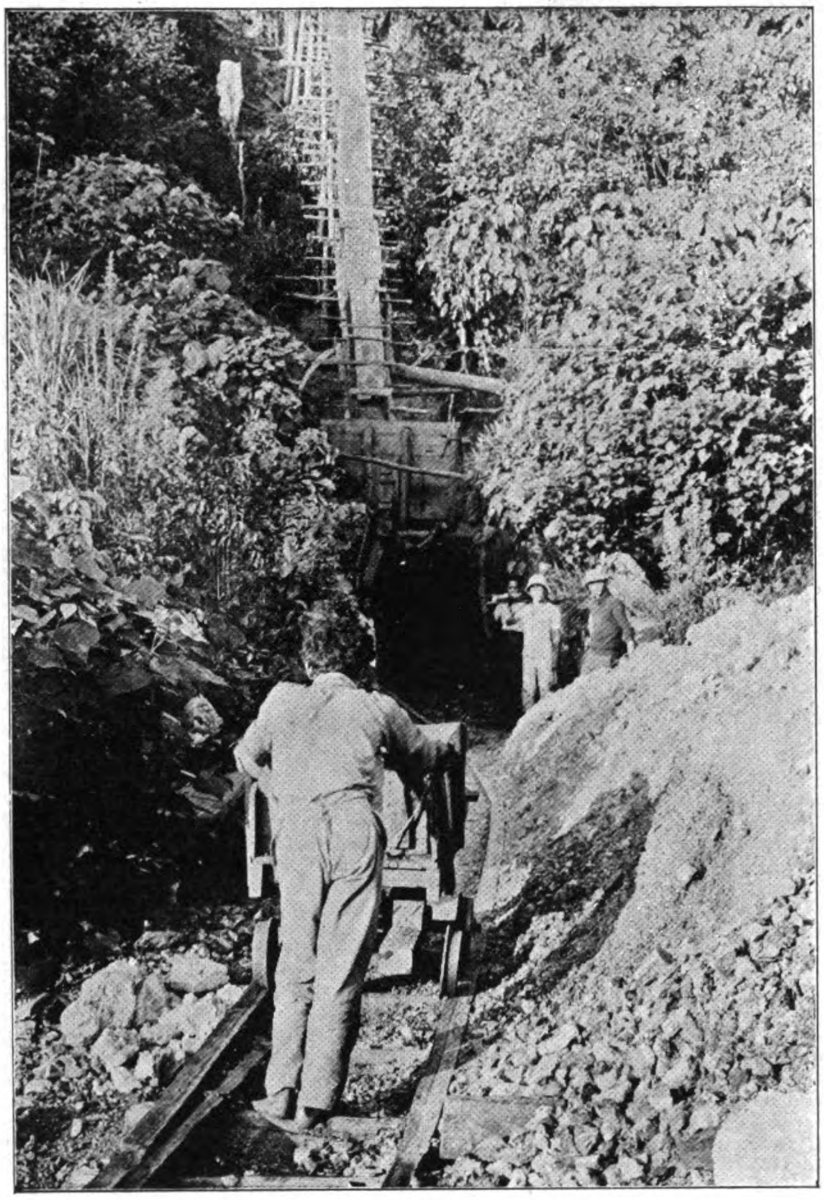
There is a marked absence of tropical diseases on this island. Although the region is elevated but slightly, there are few mosquitoes and fever is uncommon. The region is subject to a heavy rainfall annually, 100 to 120 inches, and the dry and wet seasons, which characterize most of the Philippine group, are almost wanting—the rainfall is fairly evenly distributed throughout the year.

Being heavily forested, the region is well protected, and the run-off is under better control than in the open country. The climate will not be found detrimental to the health of white men, even after prolonged residence.

The temperature is lower than that of Manila, of which the yearly average is given by the Weather Bureau as 26°.8 C. or 80.24° F. This figure is obtained from the result of 15 years' observations.

The Guinabatan river will give, at all seasons of the year, plenty of water for mining and milling purposes. Its use in the boiler installed in the year 1904 has produced no bad effects, and there will be no unusual problem involved in bringing it to the mill or boilers.

It is not believed that the Guinabatan River can furnish any power—further search may possibly find enough head and volume for turbine equipment, but it seems hardly probable. With firewood to be cheaply and easily supplied for a good many years, boilers and steam engines will give the most satisfactory equipment. Coal could be brought to the mines very easily



APPROACH TO "HAVE GOT" TUNNEL AND CHUTE

and cheaply, but there will be no necessity for it for some time to come.

For domestic purposes, there is a good flow of pure water within 100 yards of the central camp.

On all the seventeen claims comprising the group, some work has been done to develop the ore bodies. Many of these workings have exposed leads of size and value, and, on the whole, there is a remarkable surface showing over this group.

The veins strike uniformly within a few degrees of Northwest and Southwest, and dip to the Southwest at an average of 70°.

The outcrops on the Elise claim are quartz which pans high (about $15.00) in free gold. Old workings occur to a considerably extent, and it is presumed from good evidence that these were operated by Chinese over a century ago. The other cuts made recently have not progressed sufficiently to more than to assure the presence of a vein, but the line of old dumps and pits continues to the Southeast some 4000 feet; on some of them at least one vein four feet in width is exposed, dipping 65° Southwest, and with a strike of north 45° west, approximately.

The "Jessie and Alice" claims have been recently located, and no work of any importance has been done. A vein of unknown width and value outcrops at the Southeast corner of the "Alice."

On the "Sweetheart," an open cut again shows vein material, strike north 30° west, dip, with a width of six inches, which is probably a stringer paralleling a vein not yet exposed, striking North 35° West, and with a dip of 90°. Not enough work has been done here as yet to warrant sampling.

The "Nancy" and "Mabel" claims show Northwest-Southeast outcrops over a considerable distance, and two tunnels, one on each claim, have been started to test the veins. On the "Mabel" the foot wall assayed $1.65 over a distance of 60 feet, the vein being only broken into at the time of this report, and consequently the width and value of it are not known. The outcrops, however, of the "Mabel," are some of the heaviest in the group, and certainly measure over ten feet. Where one of these veins is believed to come thru on the "Gold Bug" group, the old workings indicate a width of about thirty feet, and the outcrops are the richest in free gold in the district.

The "Never Sweat" on the north side of the Guinabatan river has a high grade vein of unknown width, shown in a 35 foot shaft, from which samples of from $50 to $125 have been reported. An 80 foot tunnel to cross cut this lode has not as yet reached it. This claim and the "Mountain Maid" show apparently the same veins, of about four feet in width, of which no more may be said other than that it pans free gold, and that one assay gave a value of $6.20. Several tunnels and pits have more or less indicated the course of the vein, which is about North 45° West.

The "Holy Moses" shows one vein in a thirty foot tunnel and on the "Catherine" fraction, another outcrop appears.

On the "King" a five foot cut shows quartz carrying free gold and northwest-southwest stringers cross the "King" creek,—southeast of this location. On the "El Dinero," and "El Oro," there are as yet no workings.

The "Doris" has two noteworthy outcrops, a large vein (8 feet) striking northwest and carrying considerable copper sulphides (2.22% copper, $22.28 gold). Southeast of this is a shaft 15 feet deep, sunk on a 6 foot or wider vein, striking North 45° West.

On none of the above claims is enough work done as yet other than to show that numerous veins exist, which show more or less free gold values. The ground has been secured, but most of the active development work has been confined to the "Have Got" and "Nebraska Star" claims. These two claims are the ones where ore exists that can be milled immediately, the other claims, though showing good surface indications must be developed before more than their possibilities can be passed upon. They are, however, to be considered as valuable ground.

On the "Have Got" and "Nebraska Star" claims, there has been, and is now actively going on, considerable development. The work on the "Have Got" consists of an open cut, 177×125× 20 feet in all, which has been worked to supply the five stamp mill installed on this claim. On the southeast side of the shaft mouth in this open cut, the quartz is almost solid clear across the face for 52 feet. As shown on the plat, there seem to be two more clearly defined veins, each 8 feet in width, which have been the scene of old workings, and the easterly one assayed $12.00 per ton. There has been some dislocation here, and it is not certain if the 52 feet of quartz represents one lead, or two connected locally by a stringer system. On the other side on the shaft, the easterly vein (which may be the westerly one faulted to the northeast about 40 feet) is well defined, and the cut west of it is quartz clear thru with no defined wall on that side. Several small slip faces can be seen here and the apparent jumble of veins may be due to any one or more faults on these lines, which development underground will show up. The few faults already noticed have all been small in lateral separation and it is not believed that there will result any complicated lode-hunting underground. The old tunnel here, now caved, is stated to have passed through 10 to 12 feet of veins, as indicated on the map. There are extensive ancient workings for hundreds of feet up the hill from here—shafts, some of them thirty feet deep, tunnels, and pit, which indicate that the vein system here has not been entirely exposed as yet.

On the open cut has been sunk the 6×6 foot "Have Got" shaft, sunk vertically in the hanging wall of the east vein, and cutting it at a depth of thirty feet. The vein has a width of six feet.

From the bottom of the vertical shaft an inclined winze has been sunk on the vein to a depth of 160 feet in all, and a cross cut 215 feet in length on this level connects with the surface. The vein has been drifted on for 70 feet at this level and assayed $8.27 in gold.

The main cross cut here has been caved for some time, due to careless timbering work, but the data regarding it is taken from the report of Mr. H. D. McCaskey, Chief of the Mining Bureau of the Philippine Islands, who inspected the property and others of the region, early in 1906.

The ore from these workings was put thru' a 5-stamp Union Iron Works Mill, driven by a 15 H. P. engine. The mill was entirely unsuitable for such work, and has serious errors of construction, so that it has run only a portion of the time since it was installed.

From its operations, however, the following amount of bullion (taken from the official records at the government assay office) were shipped:

Oz.	*Fineness.*	*Value.*
16	1.733	$240.
11	.687	150.
29	.710	425.
10	.684	155.
1	....	15.
40	.703	588.
2	....	30.
22	.763	350.
5418	.858	965.
18		300.
83	.772	1320.
445	.660	620.

A total of 331 oz., with a value of $5158.00. From the mill return book, the following data are taken:

Sept. 19 to Oct. 11, inclusive. A total of 31 oz. 17 dwts. of amalgam were taken from the plates: at the clean up Oct. 13, 40 oz. 12 dwts. were obtained, a total of 72 oz. 9 dwts., which yielded 15 oz. 18 dwts. of retort metal. The clean up of Sept. 16 gave 25 oz. 11 dwts. of retort metal, and the two added were shipped to Manila, yielding 40 oz. of gold, .703 fine, valued at $588.00.

From April 11 to May 3, inclusive, 114 oz. 6 dwts. were taken from the plates, and 30 oz. 8 dwts. at the clean up, a total of 144 oz. 14 dwts. This, retorted, gave 29 oz. gold (34% of the weight of the amalgam), of a fineness of .710 valued at $425.00.

From May 7 to May 26, inclusive
Plate 66 oz. 8 dwts.
Clean up 27 oz.
Total 95 oz. 8 dwts. amalgam,

with other amalgam, amounting in all to 241 oz.; dwts., it was retorted and gave 28 oz. 14 dwts. of gold.

Run of May 31 to June 26:
Plate 116 oz. 8 dwts.
Clean up 30.
Total 146 oz. 10 dwt.

This amount of amalgam yielded 56 oz. 16 dwt. of gold (or 38.9%); a shipment of 54 oz., .858 fine, value of $965.00. There is no means of estimating the amount of ore put thru except that, as the stamps are 800 lbs. only, and crushing through 60 mesh, and as the mill is extremely poor in design and construction, it could not have been the normal amount per stamp. Delays and stoppages on account of breakage were numerous, and finally cam shafts and bearing gave way putting the mill out of commission. From the percentage of gold in the amalgam, and the amounts obtained in these runs, it is clear that an excellent saving could be made with a well designed and well built mill. The boiler, engine, and various small parts are in good shape, and re-erection can be made at small cost. The iron frame of the old mill, with its antediluvian mortar should be abandoned and replaced by a timber frame and modern mortar box.

On the "Have Got" claim is a large amount of loose material, apparently an old dump from the ancient workings, which runs $9.00 to $12.00 per ton, is well oxidized, and can be handled at a minimum cost. No exact estimate has been made of this, but at a very conservative figure 5000 tons can be handled from the claim immediately. On the "Holy Moses" claim, there is a similar dump which has not been explored.

On the "Nebraska Star" claim are the newest and most important workings. The outcrop of the vein can be traced with reasonable certainty, from the open cut on the "Have Got," to the northeastern end of the "Nebraska Star," and on the latter claim development has been considerable, and is still going on. Several open cuts expose the vein along the northwest and southeast strike and a shaft 40 feet in depth has been sunk on the foot wall. At a vertical depth of 112 feet below this, a cross-cut tunnel has been driven, cutting the lodes, and is being pushed steadily to the southwest across the strike of all the lodes the present length being 250 feet. At this date, four veins have been cut and drifts driven on each both ways from this cross cut. Vein number 1 has been drifted on to the southeast for 180 feet and to the northwest for 110 feet. It has clean cut walls, strikes south 35° east, and dips 700 southwest.

On the north drift, at a distance of forty feet from the cross cut, a fault cut off the vein, but work was carried on, and the vein picked up 12 feet to the northeast, wider and carrying more free gold than before. Vein No. 1 averages 3 ft. 4½ in. in width, southeast of the fault and about 6 feet in width to the north west. Sampling on Vein No. 1, Star Tunnel level, gave an average value of $5.21 (U. S. Currency) over an average width of 3 ft. 6 in. The values are very evenly distributed and on the southwest drift of this vein a slightly higher grade ore shoot comes in which will yield an average of $8.50. The widening out of this vein, the northwest of the fault, is noteworthy, and heavy high grade concentrates are appearing in larger quantity as development progresses.

Vein No. 2, parallel to No. 1 at a distance of 44 feet to the southwest, has been developed for 50 feet on the south and 90 feet on the north sides of the main cross cut. It has a steeper dip (to the southwest) but the same strike as No. 1. It is heavily oxidized and the sampling gave an average of $12.14 to the ton, over a width of 4 feet 3 in. In common with No. 1 it has beautifully regular walls and even distribution of values.

Vein No. 3 has been drifted on for 35 feet on the north side and for 20 feet to the south of the cross cut. Its strike is that of No. 1 and No. 2 and in width it averages 4 feet 6 inches. It will average about the same in value as No. 1 and No. 2.

No. 4 vein parallels the first three again at a distance of ten feet to the southwest. Assays of $18.29 per ton were obtained from the development of 25 feet on the southeast side of the cross cut.

A shaft has been sunk on the No. 1 vein to the cross cut, meeting it over the junction of the cross cut and the drifts on the vein. Sampling of it gave assays ranging from $14.50 on the surface ores, to $6.00 at the No. 1 vein level, indicating the even tenor of that vein. The vein in the shaft averages about 4 feet in width. This shaft gives excellent air connection for the lower workings and proves up the No. 1 vein finely, in connection with the underground and surface work.

Only a small amount of work has been done at a lower depth. A second level has been started on No. 1 vein, the opening being made from a gully a few hundred yards to the southeast.

The character of the ore in these veins and workings is uniform, a hard vitreous quartz, showing banded structure, well oxidized at the lower levels, and carrying concentrates of higher grades in the form of iron pyrite.

There is hardly a way of estimating the quantity of ore available in the "Have Got" workings, except that the open cut could supply a large amount immediately. The old dump on the "Have Got" contains under foot at least 5000 tons, ready for immediate treatment, valued at $10.00 per ton.

Vein No. 1 of the Star has been proved up on three sides on the north side and on four sides on the south side of the cross cut, and it is estimated that there is a body of ore here 300 feet long by 3.38 feet wide by 125 feet depth, or about 130,000 cubic feet. Tests have given the number of cubic feet to a ton of this ore as 13, and this gives a result of about 10,000 tons of ore, valued at $5.21 per ton in the vein No. 1, "which may reasonably be supposed to exist," from the careful sampling and development.

Veins Nos. 2, 3 and 4 cannot yet be figured on as they have not been developed. It will be only a few months' work to prove up these ore bodies by upraises and drifts, and development of ore will proceed more rapidly now that the first levels and crosscuts are completed. It is particularly difficult to place any value on a property in such a state of development as this, but the total of $100,000.00 exposed ready for immediate milling should be enough to warrant the construction of development work and the installation of a mill.

From tests made on these ores, it is found that outside of the old dumps, and the surface ores, only about 25% of the value will be free milling. There is present a variable percentage of concentrates, almost entirely iron and it will be necessary to concentrate and cyanide. The ores show no indication of becoming more basic, and probably there will be two hundred feet more in depth of partially free milling ores; no elements detrimental to cyaniding have been observed in these veins, and tests show that an extraction of over 90% may be made.

Although but few figures are available for the cost of operation of mines, mills and of ore treatment, under the conditions in the Philippines, it can be safely said that $5.00 ore can be handled on this property at a profit and anything above that will be clear gain. There are no difficulties locally in the way of economic handling of material, in fact conditions on the ground may be considered almost ideal for operation on a large scale, when extent and value are proven. Labor, water, fuel, timber, character of ore, "lay" of the lodes, etc., are all most encouraging in aspect and from surface development over a large area, it would appear that there is to be expected large, regular ore bodies. Treatment will be comparatively simple, and transportation of supplies can be done cheaply.

NATIVE MINERS AT WORK AFTER A BLAST ON "SWEETHEART" CLAIM

Mines, Mining and Minerals in the Philippine Islands

(Edited by the Bureau of Science, Manila)

[A regular feature of THE FAR EASTERN REVIEW *hereafter will be this department, which we expect to prove of general interest and value, especially to the miners of the Philippine Islands. It will contain a variety of reliable articles, observations and notes concerning the minerals of the archipelago, their development, observations on the mining situation, reports on the progress of development work by private interests, notes of a personal nature dealing with the movements and doings of the miners, and a fund of other useful information, all of which is expected in a small way at least to help along mining enterprise. In order to give special weight to the department, as regards accuracy, etc., we have arranged with the Director of the Bureau of Science to have the matter edited by the Chief of the Division of Mines.*—EDITOR'S NOTE.]

In the northeastern-most part of Luzon there is a district bounded on the west by the China Sea, on the east by the Caraballo del Norte Range, and on the north by the Formosa Straits, which bids in time to become a very rich mineral region, and this district will probably be known not for its gold or copper, though there is undoubtedly some of each of these minerals, but through its non-metallic minerals: asbestos, phosphate, mica; and, in all likelihood, it will yield gem minerals Ilocos Norte is mountainous over most of its territory. These mountains are very high along its eastern boundary between Cagayan and Ilocos Norte, with considerable foothill country to the west and a coastal plain varying from 1 to 7 miles in width, being a very irregular strip. The Caraballo range trends north and south and, likewise, the minor ranges to the west, with, of course, occasional exceptions here and there, spurs and offshoots, which tend to have an east and west trend, the most notable case being the long black range running eastward from Cape Bojeador. The mountains of that part explored by me are not high, 2,000′ being the limit, but the relief is quite pronounced, In reality there is a plateau of this height which extends from Pasuquin northeast to Bangui. This plateau though not over 2,000′ high is deeply cut by several rivers, thus giving a pronounced relief to the topography. The principal rivers are the Laoag and the Bacarra, flowing west into the China Sea, and the Bamban northward into Formosa Straits, near Bangui. None of these rivers are navigable for large craft, and the Laoag is the only one large enough even for *Virays*.

Good harbors are scarce on this coast. In the typhoon season it is very dangerous, there being no entirely safe shelter on the whole west coast north of Subig Bay. In all ordinary weather good anchorage may be found in Bangui Bay during the southwest monsoon. In the northeast monsoon the north coast is out of the question. Of the harbors on the west coast there are only three which are used, the Dirique, Currimao and Salamague, the last named the best. All of these are reef-bound and have to be entered with the greatest caution.

The climate of Ilocos Norte is considered very healthy, being much cooler here than in most coast provinces, and its seasons are quite regular. In the time of the northeast monsoon the north coast is very windy and cool. During this season the city of Laoag, capital of the province, is very healthful and pleasant to live in. The word Laoag in the Ilocano dialect means blue skies.

Geologically the province of Ilocos Norte is quite distinct from any other I have been in or of which I have any data. It is distinctly a metamorphic area, and so similar in many ways to areas in the California coast range that anyone familiar with the latter could very easily persuade himself that he was really not in the Philippines at all, but wandering over the hills near Berkeley (Cal.). A simple statement of the formations in the order of their probable position will be sufficient in an article of this kind. From above downward we find the following formations: Raised coral reefs, marl beds, these two belonging to the Pleistocene; calcareous sandstone, coarse-grained sandstone, a brecciated jasper formation, then follows an unconformity, below which are eruptive conglomerates and tuff deposits, granulite dikes; bordering the eruptive conglomerates and the granulite is a belt of schistose rocks; the basal formation of the whole district is a dark, fine grained, in places slightly porphyritic, igneous rock, which for purposes of convenience we shall call a dolerite.

The asbestos deposits occur in the last named formation, the manganese as veins in the eruptive conglomerate formation. In the schistose rocks are found various minor products, namely, micas and talc, which may prove of future value.

It is not to be understood from this enumeration of formations that the whole succession is to be found continuous over the whole area. Indeed, uplift, folding and subsequent degradations have wrought great havoc in the stratigraphic column, and it is only by piecing together bits of information here and there that we have been able to reconstruct a record of the probable past events.

Mineral Resources.—Not until within the last year or two has any systematic prospecting been done in this province and only within the last year has any development work been carried on. And to my knowledge no geologist or mining engineer had ever visited this region previous to this time. It was long known, however, to Señor Lallave, who owns several large estates near Bengui, that mineral fibre existed on his land, though he never fully appreciated the fact. The deposits which are being developed there now and which may prove very valuable assets to the province are as follows:

Asbestos.
Manganese.
Granite—building stone.
Mica and talc.
Felspar and quartz deposits.
Mineral paint—ochre.
Apatite.

Besides these there are remote possibilities of gem minerals being found. There have been found also some poor specimens of opal; also the indications appear good for the discovery of tin.

Asbestos.—As yet no 1st-grade asbestos, or chrysotile, has been found in workable quantities though there is every reason that such will be obtained after more development work. Owing to an erroneous and entirely misleading quotation purporting to have come from the Bureau of Science and appearing in one of the Manila dailies, and quoted in this paper, inquiries have been coming into us from several European countries. To straighten out the matter I shall quote from my report (at that time confidential), to the Chief of the Division of Mines:

At present I have to say that while there is not one ton of asbestos in sight (I am using this in the sense understood by engineers) in the whole region visited by me, the indications, moreover, seem quite good for getting out in time a fair grade of asbestos and in goodly quantities.

The variety which is being taken out now is the amphibole anhophyllite and tremolite, and is characterized by having its fibres parallel to the walls of the vein. These fibres vary from a fraction of an inch in length to a foot or more. They vary also in color, from a dirty yellow to silky white, and in hardness also. On the Dungan-Dungan Estate, in an estero of the Baruyen River, one finds the nearest approach to the chrysotile asbestos but there the fibre is irregular, being found in pockets and along shear zones in the serpentine. It is unfortunate that at the time of my visit floods and land slides had almost completely obliterated the work Mr. Burdette had done at this locality.

Indications of asbestos have been found at the following localities:

Baruyen Hill—schist area.
Baruyen Valley.
Dungan-Dungan—serpentine.
Baruyen Valley—very promising.
Caraon River—schist area.
Near Pasuquin.
Dalumat.
Near Pasuquin—schist area.

In the most prominent asbestos regions, as the Thetford, Canada, the serpentine areas have been proved to be the most productive and besides are more easily worked.

Manganese.—Manganese, in the form of the oxide, pyrolusite, often mixed with limonite, has been found in a rather limited area adjacent to the barrio of Nagpartian. We find these in its most typical occurrence. All that I have yet seen comes from an *eruptive conglomerate* mass, which forms prominent black ridges on the north coast and about two miles south of Nagpartian. The manganese had its origin in small veins and pockets between the igneous boulders of the mass, but has since been concentrated by natural processes and where it is being opened up now is found as a *blanket* deposit consisting of entirely loose, more or less rounded nodules in a matrix of very red, ferruginous soil.

As to the workable quantity of this ore we cannot as yet predict. The surface indications are quite wide spread, for wherever one goes over this eruptive mass he will find these pyrolusite nodules scattered over the surface.

At present one company is opening up a small surface deposit between two limestone hills about ¼ mile from Pt. Negra, where if the deposit prove to be of any extent and depth there will be no difficulty in getting it aboard ship.—WARREN D. SMITH.

MINERALS OF MARINDUQUE

Mr. Maurice Goodman, of the Division of Mines, Bureau of Science, recently returned from a short trip to the Island of Marinduque, where he made a hasty geological reconnaissance. He reports that while prospecting has thus far been undertaken by but two or three parties, and although mining in any form has not yet begun, the field, although small, is a promising one. Among the important minerals which he encountered were gold, argentiferous galena, chalcocite, malachite, azurite and red hematite. Natural gas and several deposits of bat guano were also observed. Very fine specimens of chalcocite and galena float were discovered, but a search for their source proved unsuccessful in the limited time at his disposal.

EXPERIMENTS WITH TALC

Mr. George Richmond, of the Chemical Division, has been experimenting lately with some talc brought from Ilocos Norte by Mr. Smith, and he finds that much of this material compares very closely with the commercial substance known as Agalite. Agalite, or fibrous talc as it is commercially known, is extensively used in the manufacture of paper. Like asbestos, it has a distinct fibrous structure, which

property causes it to blend well with the vegetable fibers of paper pulp and admits of its retention in paper without the great loss which accompanies the use of sulphate of lime, China clay, and other mineral loading materials.

According to the statistics of the New York State Geological Survey for 1905, there were produced 67,000 short tons of fibrous talc, valued at $469,000, an average of $7 per ton. Practically the entire output of this material finds its way to the paper mills. Judged by physical properties of the Ilocos Norte substance, it would be considered a very good quality for the above mentioned purpose. It grinds well, it is of a good color, and is especially free from grit. Analyses of the Ilocos Norte material, and the standard agalite are given below.

	Specimen examined.	*Agal te.*
Water (loss on ignition).....	2.33 %	2.67 %
Silica (Si O2).....................	57.62 ,,	61 82 ,,
Alumina (Al 2 O3)............	1 36 ,,	1.59 ,,
Iron (Fe 2 O3)...................	1.66 ,,	
Lime (Ca O)	13.38 ,,	3.65 ,,
Magnesia (Mg O)	24 18 ,,	29.98 ,,
Specific Gravity...............	2.84 ,,	2 6 2 8

INVESTIGATIONS

Mr. W. D. Smith has just returned from Cebu where he spent two and one-half months making a geological map of about thirty-seven (37) square miles of territory comprising the Compostela-Danao-Carmen Coal Fields, and the Acsubing Lead Deposits. In the latter part of the work Mr. Goodman coöperated. The topographic base map for this work was executed by Messrs. Goodman and Ickis.

Mr. M. Goodman spent the month of January in the Island of Marinduque, investigating the lead and other deposits on that Island. A full report of this work will be given in the next number of this Department.

Mr. Ickis has left for the Paracale and Mambulao districts, Camarines, to make a preliminary examination of the gold fields, and to obtain data regarding the operation of the new dredge, recently installed by a New Zealand Company.

Mr. Richmond, of the Chemical Division, is at present engaged in an investigation of the adaptability of the Ilocos Norte mica and talc for use as loading materials in paper making.

Dr. Cox, of the Chemical Division, is conducting a very complete investigation of the black sands of the Philippines, along lines similar to those employed by Dr. Day of the Geological Survey.

Mr. Henry Ferguson has sailed from San Francisco for Manila. Mr. Ferguson, who was formerly connected with the Cleveland Cliffs Iron Co, Mich., comes to fill the vacancy created by the resignation of Mr. A. J. Eveland.

PERSONALS

Mr. A. J. Eveland, Manager of the Eastern Mining Company, is now Manila in the interests of his Company.

Mr. Benjamin Smith Lyman, the Pennsylvania coal expert, who has been in Cebu for some months past, is, we regret to report, very ill in the city of Cebu, but from our last communication we learn that he was somewhat improved.

Mr. W. A. Kissam, Manager for the syndicate which has taken over the Compostela-Camansi Coal Fields, has returned from Hongkong with his family from the United States. Mr. D. M. Carman, of the same Company, has gone to Cebu.

Mr. Curran has gone to Ilocos Norte to look into the asbestos properties in the vicinity of Nagpartian and Bangui.

CROSSING SIBERIA BY RAIL

(Concluded from page 315.)

amount of water-borne freight is limited, The rates, both by river and canal, on account of the short open season, are very high. The most important rivers are the Om, the Irtysh, the Ob, and the Yenisei—the two latter being connected by a canal which joins Tiumen and Irkutsk. Carts are generally used for transport, carrying large loads over almost impassable roads.

The border range of Siberia—the Urals—is low and well wooded, and falls away gradually into the steppes, which are unvaried save for forests of birch and fir, until the foothills of the mountains which surround Lake Baikal are reached. Thenceforward the country is rugged and grades considerably, until the Chingan Mountains are succeeded by the rolling grass country of northern Hei Lung Chang. While the miles of steppes showed only occasional signs of cultivation, a patch here and there or a little clearing in the brush, the country about Irkutsk is much more thoroughly settled; there are well-tilled fields, and the villages look more prosperous than those of central Siberia. Beyond Baikal, also, wheat and barley are grown in the valleys; but from Tchita to the east there are few signs of habitation, and the district between Manchuria station and Harbin is bare and wind swept, and almost untouched by the farmer. Around Harbin, however, the land yields a large annual crop.

Harbin and Its Flour Mills.—Harbin, the most important city in Northwest Manchuria, is divided into nine parts—the administration, military, hospital, manufacturing, river, railway, old, new, and Chinese towns. The hospital town, however, is chiefly composed of barracks, and in the manufacturing town there is very little manufacturing. The flour mills are in the river town; they are fairly large, prosperous, and in most cases are adding to their plants. At present they are operated by steam power; but it is proposed to experiment with water power as well. Their machinery is almost entirely from Zurich; but some of the small pieces are made in Moscow. Grain is delivered to them at 40 kopecks (kopeck, one-half cent) per pud (36 pounds), and the flour sold at 1 ruble (ruble, 51½ cents) 90 kopecks, 1 ruble 80 kopecks, 1 ruble 65 kopecks, and 1 ruble 40 kopecks, per pud, according to the quality. The largest has a capacity of 3,000 puds per day, but this will be more than doubled when the additions are completed. American flour is still popular with the Chinese, but owing to the low cost of the native product it is being supplanted by degrees. Harbin is a distinctly Russian town; cabmen, waiters, and servants are white rather than Chinese.

South of Harbin the agricultural implements are even more primitive than in Siberia itself; but, as the country is extraordinarily fertile, the crops are large. The chief grain is kaoliang, a sorghum millet, which grows to a great height and which the natives use for flour and fodder. Beans form the other staple, there being little else except garden truck. The mineral wealth is entirely unexploited, with the exception of the coal mines at Fushun, which the Japanese work in a small way, and some coal deposits near Tiehling, which the Chinese are said to be working. The quality of coal from the Fushun mine is not very good, being filled with shale.

Trade Opportunities.—The most apparent need of Siberia and Manchuria is agricultural machinery. The territories are sparsely settled, and the areas capable of cultivation are great. Agricultural schools have been established at several places in Siberia, and a certain number of steam plows, reapers, and similar implements are now in use, but the field has never been thoroughly canvassed. At the large towns electric plants are in operation, which, with the general use of the telephone and the telegraph, show that there should be a demand for electrical machinery.

To secure a supply of pure water, artesian wells have been drilled at some places, and the sale of apparatus for this purpose, windmills for the isolated farmers, and filters should find a ready market, while the demand for mineral waters might be supplied by the exploitation of the numerous mineral springs. Foreign canned goods are used to a considerable extent in Siberia, although they must compete with the native article.

The sale of woolens, cottons, dust (automobile) glasses, cheap boots and shoes, cutlery, tools, axes, and lanterns would be increased by establishing closer relations with the local markets. In a few places there are grain elevators; but they are neither large nor numerous enough to handle the crops. The investor, in partnership with a Russian, whose presence is necessary in order to represent the business with the administration and railroad officials should find this also a source of profit.

(Continued on page 338.)

HEMP STATISTICS, MARCH 1st, 1907

(Courtesy of C. N. NICHOLSON, *Secretary Manila Chamber of Commerce.)*

Arrivals of hemp at Manila up to 28 February.....................		100,209 *Bales.*
Arrivals of hemp at Cebú up to 28 February.......................		33,396 "
Arrivals of hemp at all parts up to 28 February....................		133,605 *Bales.*
Stocks on hand in Manila and Cebú, on 1st January 1907............		63,432 *Bales.*
TOTAL..		197,037 *Bales.*
Exports to all parts to date 28-2-07..............................	108,634 *Bales.*	
Local consumption estimated at..................................	800 "	109,434 *Bales.*
Total stocks at Manila and Cebú on 1st March 1907.............		87,603 *Bales.*

PHILIPPINE HEMP MARKET, FEBRUARY, 1907,

Date	*Vessel*	*London*	*L'pool.*	*Atlantic U. S. A.*	*Pacific California*	*East & Australia*	*Other pts.*	*Total Bales*
	Fwd:—	26,198	9,276	20,001	2,600	400	3,700	62,175
Feb. 1	Rubi..............	3,350	50	....	....	....	800	4,200
" "	Loongsang.........	950	1,350	....	....	....	798	3,098
" 5	Tsinan...........	......	....	....	....	....	68	68
" 8	Yuensang..........	......	....	....	....	....	350	350
" 9	Zafiro	......	....	....	....	....	100	100
" "	Hinchaw, Cebú....	......	....	....	....	....	130	130
" "	Wray Castle, Cebú..	......	....	6,295	....	....	....	6,295
" 15	Loongsang.........	......	....	....	....	....	107	107
" "	Kumano Maru......	......	....	....	....	....	567	567
" 16	Rubi..............	1,000	....	....	....	....	500	1,500
" 17	Euphrates.........	3,833	....	....	....	....	500	4,333
" "	Tremont...........	......	....	....	400	....	100	500
" 18	Kaifong, Cebu.....	......	....	....	....	....	35	35
" "	C. Lopez y Lopez ..	3,125	....	....	....	....	....	3,125
" 20	Schuy I. Hill.......	......	....	6,200	....	....	....	6,200
" 25	Nikko Maru........	......	....	....	....	80	....	80
" 26	Antilochus.........	10,504	4,417	....	....	....	850	15,771
	TOTAL..................	48,960	15,093	32,496	3,000	480	8,605	108,634

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

OSAKA ELECTRIC LIGHT COMPANY.—This company has decided to increase its present capital of -Y-4,000,000 to -Y-15,000,000.

PYENGYANG-CHINNAMPO RAILWAY.—The latest announcement about this line is that the Japanese are organizing a private company to build an electric road between the two places. The estimated expense will be -Y-1,800,000.

ELECTRIC TRAMWAY, KIANGMOON, SOUTH CHINA.—Mr. Ip Yan, manager of the Wa Yek Company, Hongkong, proposes to start an electric tramway company at Kiangmoon, with a capital of $1,200,000 Mexican currency, and has asked for a concession to this end.

YOKOHAMA ELECTRIC RAILWAY.—Mr. Yasuda Zenjiro has purchased more than half the shares of the Yokohama Electric Railway and is trying to buy up those yet outstanding. The millionaire's object is to extend the present line as far as Nagoya along the Tokaido, and thence to Osaka *via* Ise, while another line will be laid between Nagoya and Kyoto. The estimated cost of the undertaking reaches the gigantic figures of -Y-70,000,000.

FORT MCKINLEY LIGHTING SYSTEM, P. I.—Messrs. Germann & Co., of Manila, have secured the contract from the War Department for the installation of a complete electric-lighting system at Fort McKinley, the great military reservation near Manila. Their bid was $47,990 gold. Other bids were offered as follows:—Messrs. Castle Bros.-Wolf & Sons, $48,960; Messrs. Grant & Co., $61,448, and the Bryan-Landon Company, $47,600. The last-named firm was the lowest bidder but there was a flaw in its bid which caused it to be turned down.

RAILWAYS AND RAILWAY SUPPLIES

KIANGSU PROVINCIAL RAILWAY. The first section of the provincial railway from Shanghai to Hsiakow has been inaugurated, and construction is expected to procced without interruption.

KIANGSI RAILWAY.—A draft contract of a loan of Tls. 4,000,000 from Belgium for the Nanchang-Kiukiang Railway has been sent to the Ministry of Posts and Communications at Peking for approval by the Director-General of the line.

KAIFENGFU-LOYANG RAILWAY.—This railway in Honan is divided into two parts—eastern and western—the eastern being from Chenchow to Kaifengfu and the western from Chenchowfu to Loyangfu. The eastern section is reported completed and the western to be about ready to be opened.

CANTON-AMOY LINE.—The survey of the railway from Canton to Amoy—the Kuang-Hsia line—is in progress. It will traverse eastward from Canton through Polo, Kuishan, the Haifeng, Lufeng, Hweilai and Kiehyang prefectures, to Ch'aochou-fu, and from there through the Haiyang and Jaop'ing prefectures in Fukien, and so on to Amoy.

FOKIEN PROVINCE RAILWAYS.—Cheng Pao-seng, a Chinese railway official, has been touring the Straits Settlements, the Federated Malay States, Rangoon and Java, of late, collecting money for railways in Fokien Province, China. Singapore Chinese alone subscribed 100,000 fully paid £1 shares. The scrip bears interest, immediately, at the rate of 6 per cent *per annum.*

SZECHUAN-HANKOW RAILWAY.—The British and Chinese Corporation has offered to find funds for the construction and equipment of the Szechuan-Hankow Railway, which would be the first section of the Szechuan-Tibet line. The gentry and student class are, as usual, opposing the proposal, and are sending representatives to Peking to fight any agreement to this end.

RAILWAY CONSTRUCTION IN CHINA.—China at the moment, says *The Peking and Tientsin Times*, has many railway schemes, most of which are being watched with interest. Few, if any, however, will come to anything without the assistance of foreign capital. A loan of Tls. 1,000,000 is now being negotiated with a foreign firm for the Kiukiang-Nanchang line, with every prospect of success.

YUET HAN (CHINA) RAILWAY COMPANY.—The President and Vice-President of this enterprise have been denounced to the Throne for conspiracy and corruption. They are accused of the crime of making use of the monies of the company through the names of accomplices and "instruments." They are also blamed for jeopardizing the future success of the railway. The Throne has ordered a thorough investigation of the charges.

YUET-HAN RAILWAY.—A Canton telegram declares that the Mercantile Administration of the Kwangtung Section of the Yuet-Han Railway recently sent a message to the Viceroy of the Province asking him to come from Macao where he was staying and "save the railway from collapse." The message added that the contractor who undertook to reclaim for the company certain portions of the foreshore has, after borrowing large sums and ceasing work, been handed over to the Namhoi magistrate to be dealt with according to law.

PEKING-HANKOW RAILWAY.—The present available stock of freight cars on this line is inadequate to cope with the traffic, especially from the Province of Honan, which is pouring its produce into the Yangtsze Valley for shipment at Hankow. An excellent bituminous coal is found in the District of Liu-Cheng Hsien, near the Ching-Huan Railway. The colliery is joint foreign and Chinese worked, and coal from it can be laid down by rail in Peking at $9 Mexican per ton. A new line is now being constructed which is to link up the Province of Shensi with the Ching-Huan Railway at Chengchou, while another is being proceeded with which will tap the rich mineral fields of Shensi, and act as a feeder to the Cheng-Huan Railway. It is expected that it will be completed this year.

SOUTH MANCHURIAN RAILWAY COMPANY.—The *Kobé Herald* announces the appointment of the following directory of the South Manchurian Railway Company:—Messrs. Kunisawa Shinbei, Kiyono Chotaro, Kubota Katsumi, Inudzuka Shintaro, Tanaka Seijiro and Nonomura Kingoro. Mr. Nakamura Jeko, Director of the Financial and General Affairs Bureau of the Formosan Government, has been appointed Vice-president of the company, and Mr, Kimigewa has the appointment of Chief Engineer. The matter relating to the allotment to the shareholders of 200,000 shares, the company's first issue, and the first payment on the shares, have been duly completed. Five hundred thousand shares have been allotted to the Japanese Government as representing the amount of -Y-100,000,000, the Government's share of the capital. The interest on the sums deposited as security in connection with the application for shares have reached -Y-1,170,810. This sum will become a part of the company's finances.

CHINESE RAILWAY DIRECTORS-GENERAL.—Prior to the formation of the Ministry of Posts and Communications, at Peking, H. E. Tang Shao-yi was Director-General of the Peking-Hankow Railway, the Peking-Kalgan Railway, the Shanghai Railway, and the Imperial Railways of North China, the latter running from Peking to Shanhaikuan and thence to Newchwang in one direction and Hsinmintun in another. Since his admission into the Ministry of Posts and Communications as Senior Vice-President, his office as Director General was abolished and the railways above-named were put under the immediate control of the ministry. On the recommendation of the ministry the Peking Government is going to appoint a Director-General to each of the four railways in question, to be under the supervision of the President and the two Vice-Presidents of the same ministry. These Directors-General are each to be assisted by a Director selected by the ministry with the approval of the Government.

KOWLOON-CANTON RAILWAY.—Construction work in the New Territory of Hongkong is being pushed ahead as rapidly as possible on this line, according to the *China Mail.* The roadbed is now almost continuous between Fan Ling and a point near the Chinese border, except for numerous bridges and culverts that will be necessary. Over the whole of this distance the embankment has been raised from 6 to 12′ and as in the rainy season the low-lying ground in the vicinity rapidly becomes flooded special precautions as to drainage are necessary. The embankments are being made from earth taken from the surrounding fields and from a trench dug alongside of the line, and among people who know the soil it is considered doubtful whether or not they will stand the rainy season. This earth possesses peculiar properties, and while in dry weather it is as hard as cement, in the rainy season it speedily becomes soft and spongey. At the stream at the foot of the hills between the paddy fields crossed after leaving Cheung Shui and Tai Po a bridge of considerable length will be necessary, and the line for some distance will be laid on a cutting out of the side of the hills. Everywhere between Sam Chun and Tai Po groups of men and women are hard at work breaking metal to ballast the line, and brick-making has become quite a flourishing industry in anticipation of the demand for bridge building. The line between Tai Po and Lok-lo-ha does not appear to have made much more progress so far, but the Sha-tin Valley, right up to the mouth of the tunnel. is alive with workers.

IMPERIAL CHINESE RAILWAY BONDS.—On January 9th the Hongkong and Shanghai Banking Corporation invited subscriptions for £650,000 5 per cent Sterling Bonds of the Imperial Chinese Railways—Shanghai-Nanking-Line —being part of a loan for £3,250,000, of which £2,250,000 had been issued. The bonds are £100 each, and the first coupon for £1, being interest at the rate of 5 per cent *per annum* on the instalments, will be payable on June 1st next. The subscription price is par, and the loan is for 50 years from June, 1903, but the bonds are redeemable at six months' notice after 12½ years, and up to 25 years at 102½ per cent, and after 25 years at par at the option of the Chinese Government. In addition to the unconditional guarantee of the loan by the Chinese Government, both as to principal and interest, it is provided by the agreement that in the event of default in payment of principal or interest, the whole of the railway, with all its appurtenances, shall be handed over to the British and Chinese Corporation, to be dealt with by it in such manner as will ensure the proper protection of the interests of the bondholders. The loan agreement provides that in any negotiations between the railway administration and the British and Chinese Corporation, the corporation shall represent the bondholders and be empowered to act on their behalf. It also reserves the power to make a further temporary issue of £250,000 bonds at 6 per cent *per annum* for the purposes of paying for the necessary land for the railway, to rank *pari passu* with the present and former issues as regards guarantee and security, but to be redeemable at par at any time on giving six months' notice. The present loan is to provide further funds for construction and equipment and a report by the consulting engineers on the present position of the railway is included in the prospectus. According to the prospectus the subscription list which was opened January 9th was to be closed at or before 4 o'clock on the 11th. The bonds, however, were so largely over subscribed that the list for London was closed at 3 o'clock on the first day. It is stated that one application alone was for the sum offered. The bonds are quoted at 1 premium.

PUBLIC AND PORT WORKS, DOCKS, WHARVES, ETC.

RIVER AND CANAL CONSERVANCY, CHINA.—The Ministry of Agriculture, Works and Commerce, at Peking has memorialized the Throne recommending the necessity for establishing a Conservancy for Rivers and Canals throughout the whole Empire, with headquarters at Peking, under a special High Commissioner, or Inspector-General.

MANILA SEWER AND WATERWORKS CONSTRUCTION BONDS.—Two millions of dollars worth of sewer and waterworks construction bonds for the City of Manila were sold recently in Washington by the Bureau of Insular Affairs. The total amount of the sale was $2,117,005, gold, the relatively low price being due to existing conditions of the money market. The purchasers and the premiums were as follows:—$15,000 to William Larrabee, Clermont, Ia., at 1.091; $30,000 to R. W. Rohler, Detroit, Mich., at 1.09; $1,955,000 to William A. Read & Co., New York City, at 1.05777.

TOKYO HARBOR WORKS.—The Tokyo Harbor Works Investigation Committee has submitted to the City Assembly its Harbor Works Bill. It is proposed to raise a foreign loan of £4,890,000 on the London market in connection with this scheme. The loan is to be raised in three installments, £2,000,000 in 1907, £2,000,000 in 1911, and £890,000 in 1914. It is proposed to raise the loan at more than £96 per £100 face value and the rate of interest is to be 5 per cent. The documents pertaining to the present foreign scheme have been sent to the Governor of Tokyo for his consideration, and afterwards the Mayor of Tokyo will apply to the Ministers of Finance and Home Affairs for their approval.

PUBLIC WORKS, PAHANG.—Provision is made in the Pahang, F. M. S., estimates for a long list of works and buildings, among them being $41,500 for a water supply for Bentong, a thriving mining center; $30,000 for a new *astina* for the Sultan of Pekan; and $10,000 for town drainage at Bentong. The other principal works include $5,000 for a house for the Executive Engineer at Kuantan, $3,500 for a surveyor at Bentong, and $9,000 for clerks' quarters at Lipis, Raub and Bentong. Police buildings, including stations at Pekan and at the new town of Gambang, in the Kuantan District, are estimated to cost $14,150. Municipal services account for $12,475, which sum includes $6,200 for the extension of the Kuantan water supply to the European Quarter at Teluk Sisek. Nine thousand dollars are provided for various hospital buildings, including an additional ward at Bentong. For new public offices and for extensions to existing one $10,200 are voted, of which $5,000 are for Pekan. Provision of $4,000 is made for a landing stage at Kuala Kuantan.

NEW DREDGER FOR PENANG, S. S.—For the improvement of the Port of Penang, Messrs. William Simons, Ltd., Renfrew, have launched a powerful bow-well, center-ladder, bucket, barge-loading dredger named the *Crab.* The dredger has been constructed under the direction of Messrs. Coode Son & Matthews, civil engineers of Westminster, assisted by Mr. Robert Anderson, Renfrew, local inspector. The *Crab* is classed at Lloyds. Propelling power is provided by one set of triple-expansion surface-condensing engines, supplied with steam from a steel boiler of Scotch type, constructed for a working pressure of 160 lbs. per square inch, according to *The London and China Express.* The auxiliary plants of the most modern type, including an independent circulating pump for circulating purposes, independent feed donkey pumps, evaporator, etc. and is fitted up in the engine room. The dredger's buckets have a total dredging capacity of 350 tons per hour and the maximum dredging capacity of 30′ below water level. Suitable clutches are provided for disengaging to and from the propelling engines and dredging gear, the arrangement of the latter allowing the dredger to make its own passage through banks and shoals. Comfortable quarters are provided for the officers and crew, and a complete electric light installation is fitted up on board, so that the dredger may be kept continuously at work, day and night, if required.

SHIPBUILDING AND GENERAL MARINE MATTERS

"AWA-MARU" IN DRYDOCK.—The N. Y. K. steamer *Awa-maru*, which stranded at Redcar, December 27th, is now in drydock at Newcastle-on-Tyne, where she will be overhauled and made seaworthy.

JAPANESE SHIPPING.—Official returns show that there were 1,492 steamships in Japan at the end of December, displacing 1,034,455.96 tons gross and 654,243.48 tons registered, whereof there were one vessel over 7,000 tons gross, twenty 6,000-7,000 tons, six 5,000-6,000, thirteen 4,000-5,000, forty-two 3,000-4,000, 108 2,000-3,000 and 131 1,000-2,000. Sailing-vessels numbered 4,044, displacing 346,262.02 tons gross and 324,668.38 tons registered, whereof one each was of over 3,000 tons gross and of 500-1,000. There was no ship between 1,000-2,000 tons.

LAUNCH OF THE "TJIKINI."—The steamer *Tjikini*, constructed for the Java, China and Japan Line, has been

launched from the dockyard of the De Schelde Royal Company, at Flushing. The vessel has a length of 373′, a width of 45′ 5″, and a depth of 30′, destined for the cargo service, but has also accommodation for some first and second-class passengers, and for a large number of other classes. Special installations have been made for quick loading and discharging. The engines are of the vertical triple-compound system, with cylinders of 24½,40, and 67″ diameter, and 48″ revolutions, developing 1,700 h. p., and 70 r. p. m.

Yangtsze Shipping Amalgamation.—The proposed amalgamation of the Japanese steamer services on the Yangtsze River has now matured. These services are now being carried on by the Nippon Yusen, Osaka Shosen, Hunan, and the Daito steamship companies. The capital of the new company will be -Y-12,000,000. The steamers and other properties of the above four companies, which are used on the Yangtsze, are valued at -Y-8,000,000, and the remaining -Y-4,000,000 are being raised by the issue of new shares for public subscription. The promoters expect an annual subsidy of -Y-800,000 from the Government during five years.

New Pacific Steamship Service.—The Grand Trunk Line of Canada has placed orders in America for several large cargo and passenger boats for service on the Pacific Ocean. The competition for the trade of the Pacific between the various steamship companies is now exciting much interest in shipping circles. For the North German Lloyd Company six new steamers are being built for its eastern trade, and when they are complete the company will extend its line from Yokohama to San Francisco, making the latter the final port on the voyage from Bremen. This will give the German company a passenger service around the world, with the exception of the land journey from the Pacific Coast to New York. It is stated that contracts for carrying passengers and freight have been made with the Gould railroads.

Inoshima Dockyard.—Inoshima, an island near Onomichi in the Inland Sea, was one of the few Japanese places to profit materially by the war. Its proximity to Hiroshima, which was the most important military station in Japan during the war, brought the Inoshima Dockyard Company considerable business, and its position in the center of the Inland Sea insures a continuance of work. The company possesses two dry-docks capable of docking vessels of 3,500 and 2,500 tons respectively. The number of vessels docked during 1905 was 68. The increasing size of ships makes it necessary for the company to enlarge its facilities and it proposes to increase its capital from -Y-200,000 to -Y-1,000,000. The docks are to be enlarged so as to take vessels up to 8,000 tons and a shipbuilding and engine works plant will be added.

Coal Transportation to Philippines.—Bids have been opened at the Bureau of Equipment, Navy Department, Washington, for the transportation of 50,000 tons of coal to the United States coal depot, Sangley Point, Manila Bay, or for furnishing and transporting that amount. Proposals were received as follows, the amounts being in gold:—(a) For transportation only in American vessels; (b) for transportation only in foreign vessels; (c) for American coal delivered at Sangley Point. The following bids were received: Frank Waterhouse & Co., Seattle, Wash., (b) $5.35 per ton; $267,500. J. J. Moore Co., San Francisco, Cal., (d) $8.85; $442,500. Chas. Dunlap, New York, (c) $8.88; $444,000. Howard, Holder Rowat Co., New York, (b) $4.98; $249,000. Arthur Sewall & Co., (a) $6.50 per ton for 5,000 tons. Castner, Curran & Bullitt, London, (d) $8.75; $437,500. Samuel Holmes, 66-8 Broad St., New York, (b) $5.60; $280,000. Funk Edye & Co., New York, (b) $4.93; $246,500. Lind & Co., New York, (b) $4.70; (c) $7.50 and $7.25. Mc. Call, Dinning & Co., Baltimore, (d) $8.71; (b) $5.08½.

MINING, MINERALS AND THE METAL TRADES

Iron Ore in Shantung.—Magnetic iron ore, containing 65 per cent of iron, has been discovered in the Province of Shantung.

Manchurian Gold Mines.—A dispatch from Harbin says that Russia has returned to China the gold mines in the Amur Province.

Formosan Iron Works.—Japanese capitalists are organising the Formosan Iron Works with a capital of -Y-1,000,000. The head office and workshops will be in Formosa.

Burma's Oil Pipe Lines.—The Burma Oil Company has placed contracts with American and Glasgow firms for 275 miles of pipe lines to convey oil from wells in Burma to the seaboard.

Yokohama Engine and Iron Works.—This concern has declared a dividend of -Y-15 per share for the workings of the latter half-year of 1906. The report shows a balance of -Y-2,500 after all accounts had been paid.

Gold Mines in Korea.—Out of 40 applications for the possession of mines in Korea, three have been granted the privilege of commencing operations. This refers to applications made by private individuals, probably Koreans.

Mines of Shantung Province.—During 1904 the mines of the Shantung (China) Mining Company had an output of 90,000 tons of coal, and in 1905 of 134,000 tons, and coal is now laid down in Chefoo at prices considerably under Japanese and Kaiping supplies.

Raub Gold Mines, F. M. S.—On a hill about 1,000′ north of No. 2 Shaft the jungle has been cleared and several pits sunk; also a crosscut put in 50′. An enormous quantity of surface ore is being exposed, and further pits are being sunk. A crosscut has also been started from the east side of the hill, A Singapore paper says this is the best news the shareholders have received for some time.

Coal and Iron Development, China.—American Consul Thornwell Hayes affirms the report that there has recently been found in the vicinity of Nanking, on the banks of the Yangtsze, undisputed evidence of immense iron and steel deposits. "In a recent conversation with a Chinese official," says the Consul, "I was told that capital was needed to develop these mines, but that to avoid arousing Chinese prejudice such capital should be invested as emanated from Chinese. This official is greatly enthused over these dormant potentialities."

Salimbau Coal Company.—With reference to this company, in which many Singapore capitalists are interested, the Netherland Indies Share List says that the mining engineer who was sent to investigate the property reports a series of strata containing coal of good quality easily worked, and capital will be asked for in accordance with the estimates of expenditure. Development will then be begun on a small scale and a portion of the concession will be thoroughly prospected. The experience gained in this way will show what it will cost to win the coal and the probable profit to be made.

Fushun Coal Mines.—An engineer, who visited the Fushun coal mines recently and carried out full investigations, denies the reports that the coal from the mines is not very good in quality. On the contrary, he says, the coal is excellent, containing much carbonic and volatile elements. It has not much sulphur and in this respect is superior to the Japanese coal at Kyushu and Hokkaido. The area of the mines extends to 4,000,000 *tsubo*, the depth of the strata being 110′. The total quality of coal is estimated at about 500,000,000 tons.

Gold on the East River, China.—Canton advices are to the effect that Chinese restlessness is seen in many reports which are made from time to time as to the necessity of opening mines, and in the requests made by individual Chinese for permission from the authorities to do something of the kind. It has been reported in native papers that a move has been made by one Chinese to test the accuracy of his prospecting up the East River, by which he is convinced that, in the Mountain of the Goddess of Mercy, at Tsang Shing, there is gold. The gentleman in question has sent in a petition to the Viceroy, who has granted the necessary permission for searching.

Malay States Tin Exports, 1906.—The advance statement of block tin and tin ore exported from the Federated Malay States during 1906, and of the duty collected thereon, shows that the total quantity of tin was 782,296.89 piculs (1 picul = 133 ⅓ lbs.) as compared with 821,780.86 piculs in 1905, a decrease of 39,483.97 piculs. Of this decrease Selangor shows a decrease of 21,000, Perak of 10,000 and Negri Sembilan of 7,000 piculs. The duty paid was $9,758,881.42 local currency, an increase of $769,125.95 over the amount paid in 1905. Perak paid $577,000, Selangor $161,000, and Negri Sembilan $29,000 increased duty. The figures for Pahang are not yet available.

Gold Mining Concession, Korea.—The *Cologne Gazette* announces that a gold-mining concession north of Pingyan (Phyong-yang) has been granted to a German firm at Chemulpo. Pingyang is 36 miles from the sea on the Taidong. It is well populated, being the center of a silk industry, and 20 miles off, at Keum-san, are rich gold-washings. This metal, especially in the shape of river gold, abounds almost everywhere in the northern half of the peninsula. The output reaches $5,000,000 (Mexican) worth a year. Gold-mining is carried on by an American company, which is working the Wonsan deposits, by British subjects near there, and by German, Japanese, and Russian concessionaries. Copper, iron and coal are also found in abundance.

Siberian Gold Mines.—Not long ago, says a Russian paper, certain interested parties, more particularly a number of Australian gold-mining men, disseminated misleading reports to the effect that the Russian Government was badly disposed towards the establishment of foreign enterprises in Russia. These rumors brought about a depreciation in the shares of Siberian companies. However, the danger speedily disappeared, chiefly owing to the establishment. without any alteration of the rules, of the Orsky company. The leading financial organs, with a feeling of satisfaction, note these facts, which are accompanied by a general improvement in the financial situation. The result has been a strengthening of the demand for shares of companies which are operating in Siberia.

Imperial Steel Works, Japan.—The Japanese Government is placing contracts in the United States for the equipment of a very large steel works, to be erected on the Island of Moji. This plant, which will entail an outlay exceeding $10,000,000 gold, will consist in the first instance of two bar mills, tube mill, blooming mill, rolling tables, furnaces, cranes, and a complete outfit of steel-making plant. The name of the proposed concern is the Imperial Steel Works. The contracts are being made through the New York offices of three Japanese firms: Messrs. Mitsui & Co., Takata & Co., and Okura & Co. A general line of machinery for a large lead mill and complete plant for a tin-plate mill to be erected under Japanese auspices in the vicinity of Kobé is also under order in America.

Ashio Copper Mines, Japan.—According to one authority the recent riots at the Ashio copper mines near Nikko were possibly the culmination of a dispute which has been going on for many years. The mines are the richest in Japan, the output of copper in 1904 being 10,965,862 *kin* (1 kin 1.322 lbs.). When copper was first discovered the villagers did not recognize that the workings of the mines meant the destruction of the country around as far as agriculture was concerned. They speedily found, however, that their crops were being ruined and that the flow of waste products into the rivers was killing all the fish. The late Ichibei Furukawa, recognizing the hardship under which the people were suffering, offered to buy the lands of all those who were affected at a price to be fixed by arbitration. Some of the villagers were agreeable but the majority refused to part with the lands which their forefathers had tilled and they intimidated the minority so that Mr. Furukawa's well-meant offer was declined. Since then there has been constant friction.

FINANCIAL AND MISCELLANEOUS

Hongkong Fire Insurance Company, Ltd.—The 1906 account of the company shows a credit balance of $435,236.75 (Mexican).

Sugarmill Machinery.—The Dutch East-Indian Government is contemplating the construction of sugar-cane mills in Madoera.

One-Hundredth Bank, Japan.—The One Hundredth Bank of Japan has received the approval of the shareholders to increase its present capital of -Y-600,000 to -Y-2,000,000.

Rice Mill for the Moro Province, P. I.—The Bank of Zamboanga is the prime mover in the establishment of a rice mill at Zamboanga to be equipped with the latest machinery from America.

Price of Gas Reduced, Hongkong.—Beginning with the first day of the current month, the Hongkong and China Gas Company, Ltd., will hereafter furnish gas to consumers at $2.75 Mexican currency per 1,000 cubic feet.

Cold Storage for Zamboanga, P. I.—Mr. F. E. Holmes, an Australian, is establishing a cold storage plant at Zamboanga, capital of the Moro Province, for the purpose of supplying to the trade Australian frozen meats, game and dairy products.

Somerset Rubber Estate.—This concern has been registered with a capital of £12,000 in £1 shares. to acquire from H. W. Bratt an estate in Perak, F. M. S., to cultivate rubber, etc. No initial public isuse. The head office is 11 Idol Lane, London, E. C.

Strathmore Rubber Company.—This concern has been registered with a capital of £25,000 in £1 shares, to acquire and develop as a rubber estate a block of land near Batarg Berjuntai, Selangor, F. M. S. Registered office, 8 Hill-st., Edinburgh. No initial public issue.

Steel Derrick, Olongapo, P. I.—The Bureau of Yards and Docks, Navy Department, Washington, has awarded to the Pittsburg Industrial Iron Works a contract for furnishing one 20-ton steel derrick at the coaling station, Olongapo, P. I., the company's bid being $3,016.

Japanese Contracting Concern.—Japanese capitalists have a scheme to organize a company with -Y-2,500,000 capital at Tientsin, China, with the object of carrying on the business of building houses and warehouses, supplying electric light and power, and also acting as commission agents in money lending.

Sengon (Java) Company, Ltd.—This concern has been formed with a capital of £22,000, divided into 22,000 shares of £1 each, of which 15,000 shares are being offered privately. The company acquires the Sengon Estate in Java and the business of rubber, coffee, pepper, cinnamon, vanilla, nutmeg, and cocoa planters.

Tokyo's Budget.—The Budget for Tokyo in the forthcoming fiscal year is calculated as follows:—*Income*—Ordinary, -Y-4,294,673; extraordinary, -Y-78,295, *Expenditure*—Ordinary, -Y-3,829,622; extraordinary. -Y-538,490. The income is about -Y-296,000 less than the previous year, and the expenditures are -Y-277,000 less.

Architectural Competition.—A competition for plants for a Protestant church in Tsingtau, the German Settlement in North China, is now open to architects resident in the Far East. Three prizes of the value of $1,500, $1,000 and $500 (Mexican) are offered. Further particulars may be obtained on application, accompanied by the payment of $4 (Mexican), to Herr Bandirektor Strasser, Tsingtau.

Japanese Machinery Company.—A number of influential capitalists of Tokyo and Osaka are contemplating a company with -Y-2,000,000 capital, under the style of the Manshu Kigyo Kaisha, with the object of conducting the business of selling machinery for civil engineering, railways, mines, etc., the head office to be at Tokyo with branches at Osaka, Tairen, Port Arthur, Liaoyang and Mukden.

Power Gas Installation, Japan.—A contract has been placed with the Power Gas Corporation, Stockton-on-Tees, for a large power gas installation at Fuji, near Yokohama. The plant will have a rated capacity of 3,000 i. h. p., and is designed to produce about 180,000 cu. ft. of gas per hour from local fuels. The whole of the gas produced is to be specially cleansed so as to be suitable for use in gas engines.

Shoe Trade, Shanghai.—The German Consul-General at Shanghai reports that during 1906 there were imported at Shanghai 129,405 pairs of rubber shoes and 46,643 pairs of cloth and leather shoes, against 22,916 and 21,468 pairs, respectively, entered in 1904. The Consul-General adds that this shows that the wealthier part of the Chinese population is gradually stepping in the foot-tracks of western civilization.

Reconstruction of the Indo-China Steam Navigation Company, Ltd.—Messrs. Jardine, Matheson & Co., of Shanghai, announce that the scheme to divide the £10 shares of the Indo-China Steam Navigation Company into two of £5 each—one preferred and one deferred—has been agreed to by the shareholders at a meeting held in London, The interest on the preferred shares will be at the rate of 6 per cent *per annum* instead of 5½ per cent as first proposed.

FOREIGN BANK NOTES, SHANGHAI.—According to *The Celestial Empire*, Viceroy Tuan Fang has advised the Board of Finance at Peking that there are many kinds of foreign bank notes in circulation in Shanghai—over Tls. 3,000,000 worth of them—and unless a check is made at this moment it will cause bad effects upon Chinese currency. Wang Shao-yen, Director of the Bureau of Commerce at Nanking, has been sent to Shanghai to study the matter, who reports that it is necessary to issue bank notes of the Hupu Bank to be circulated in the open ports and towns to replace the foreign bank notes.

CROSSING SIBERIA BY RAIL

(Concluded from page 335)

Table of Times and Fares.—Hotels.—For convenience pounds sterling are reckoned at $5 and rubles at 50 cents in the following schedule:—

	Time of departure.	Fares.
London to Berlin (via Dover-Ostend)	9 a. m.	$69.01
Berlin to Petersburg	10 a. m.	
St. Petersburg to Moscow	10.30 p. m.	121.40
Moscow to Irkutsk	12 10 a. m.	
Irkutsk to Harbin	8 56 p. m.	
Harbin to Changchun	10.30 p. m.	5 06

a Government express trains leave Sundays and Thursdays; carriage-lighted on Wednesdays.

For food on the train $2.50 to $3 a day should be allowed, while hotel charges are as follows: St. Petersburg—Hotel de Europe, $1.75 to $10 per day; Hotel de France, $1.75 to $7.50 per day. Moscow—Hotel National, $1.50 to $5 per day; Hotel Metropole, $1.50 to $7.50 per day. Harbin—Gomaretle Hotel, $1.50 to $5 per day.

RAILWAY CONSTRUCTION, JAPAN

The railways in Japan, the construction of which has been decided upon, are as follows:—

Line.	*Section.*	*Mileage.*
Ou	Fukushima and Aomori	300
Central	Hachioji and Nagoya	224
Kagoshima	Yatsushiro and Kagoshima	94
Sanin	Fukuchiyama, Sakae and Imaichi	193
Maizuru	Fukuchiyama, Tobe and Shin-Maizuru	50
Toyama	Toyama and Naoezu	75
Hokkaido	Asahigawa and Chinai	168
Hokkaido	Asahigawa and Kushiro	191
Hokkaido	Kushiro and Nemuro	89
Hokkaido	Ikeda and Amibashiri	117
Hokkaido	Fukagawa and Rumoe	35

The lines which the Government intends to construct in future are as follows:—

Section.	*Mileage.*
Akita and Shinbota	150
Sakamachi Yonezawa	52
Yokote and Kurozawajiri	35
Sakata and Funagata	32
Funagata, Koteda and Ishinomaki	68
Sintsu and Shinbota	15
Katsuura, Ohara and Seito	13
Kofu and Iwafuchi	47
Tsuruga and Shin-Maizuru	51
Imaichi and Kogori	139
Hiroshima and Ezu	105
Tsuyama and Yonako	63
Tadotsu, Imaharu and Matsuyama	92
Takamatsu Kochi Susaki	124
Kawada and Kajima	6
Oita Miyazaki and Yoshimatsu	167
Kumamoto and Oita	83
Gifu and Takimi, (Oiwake and Funakawa)	26

The total expenditure of the intended lines is estimated at -Y-246,622,600.

CIRCULAR PROPOSAL

BUREAU OF NAVIGATION

Lighthouse Division

Manila, P. I., February 18, 1907.

Sealed proposals, in duplicate, for the furnishing and delivery alongside the Lighthouse Wharf on Engineer Island, Manila, P. I., of a Third-Order flashing light for Batag Island, will be received at this office until 11 o' clock a m , June 20, 1907, and then publicly opened. Specifications, blank forms and all available information will be furnished upon application to this office.

The Government reserves the right to reject or accept any or all bids, or any part thereof, or to waive any informality in bids

Proposals must be signed by the bidder, enclosed in sealed envelopes, addressed to the undersigned and marked "Proposals for Batag light: to be opened June 20, 1907."

WILDURR WILLING,

1st Lieut Corps of Engrs., U. S. A.,

Lighthouse Engineer.

NOTICE

February 28, 1907.

(1) The Bureau of Navigation, Philippine Government, offers for sale at Engineer Island, Manila, P. I., the following property:

(a) The steam launch SIASI, a seagoing launch 86 feet in length over all, beam 14 feet 5 inches, depth moulded 7 feet six inches, draft loaded 7 feet, draft light 6 feet, built at Hongkong in 1900. She is fitted with compound surface condensing engine and is in first-class condition, with feed-pumps and all necessary fittings attached. Has boiler of Scotch type, diameter 6 feet 6 inches in first class condition, with all necessary fittings. The hull is sound and strongly constructed and shows no sign whatever of deterioration. This launch throughout is in excellent condition and is ready to be put into commission at once.

(b) The steam launch JOLO, a seagoing launch 65 feet in length over all, beam 11 feet 4 inches, depth moulded 5 feet, 8 inches, draft 5 feet, built in 1890. Has compound surface-condensing engine in good order and a boiler of the Scotch type in fair condition. All fittings in engine room are in good condition. This launch is ready to be put into commission at once.

(c) The steam launch SUERTE, a river and harbor launch 61 feet 7 inches in length over all, beam 11 feet, draft 5 feet, tonnage 21.81 gross. Has compound non-condensing engine and Scotch boiler. Engine and boiler are in fair condition. This launch is ready to be put into commission at once.

(2) Sealed bids will be received up to and including March 16, 1907, and will then be publicly opened at 4:00 p. m. on that date. The right is reserved to reject any or all bids. Proposals must be accompanied by cash or a certified check for the amount of ten per cent of the bid. Full payment will be required within five days after the acceptance of the offer of the successful bidder, or upon delivery of the vessel which must be within five days.

(3) These vessels may be inspected at Engineer Island, Manila, P. I.

(4) Further information will be given if application is made therefor to the undersigned.

FRANK P. HELM,

Director of Navigation.

HAY AND OATS

OFFICE OF THE BUREAU OF SUPPLY

Manila, P. I., March 5, 1907.

Sealed proposals in triplicate will be received at this office up to 11 a. m. March 25, 1907, when they will be opened in the presence of the attending bidders, for furnishing 900 Tons of Hay and 600 Tons of Oats.

Proper forms and specifications may be had on application to this office.

E. G. SHIELDS,

Purchasing Agent.

Specifications on file at the Office of THE FAR EASTERN REVIEW.

OFFICE OF THE BUREAU OF SUPPLY

Manila, P. I., March 12th, 1907.

Sealed proposals in triplicate will be received at this office up to 11 a. m. May 15th, 1907, when they will be opened in the presence of the attending bidders, for supplying the Insular Government with Thirty Thousand (30,000) tons of Coal for the period from July 1st, 1907, to June 30th, 1908.

Proper forms and specifications may be had on application to this office.

E. G. SHIELDS,

Purchasing Agent.

PROPOSALS FOR MINERAL OIL

HEADQUARTERS PHILIPPINES DIVISION.

Office of Chief Quartermaster.

Manila, P. I., March 15th, 1907.

Sealed proposals, in triplicate, subject to the usual conditions, for furnishing 315,000 gallons of Mineral Oil to this Department, will be received at this office until 10:00 a. m. April 15th 1907 and then opened. Blank forms and information furnished upon application. Envelopes containing proposals should be endorsed, "proposals for Mineral Oil" to be opened at 10:00 a. m. April 15th 1907 and addressed to Chief Quartermaster, Philippines Division, Manila, P. I.

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the Director of Public Works until noon April 10, 1907, and then publicly opened, for furnishing all the materials, labor and plant, and constructing complete the San Miguel de Mayumo-Sibul Springs road and structures thereon in Bulacan Province for the Bureau of Public Works.

Envelopes containing proposals should be plainly marked, "proposal for San Miguel de Mayumo-Sibul Springs road. Each proposal must be accompnaied by bond or certified check to the amount of ₱2,000 The right is reserved to reject any and all bids and to waive defects.

Plans, specifications, and contract can be seen and examined at the office of the Director of Public Works. Additional information will be furnished upon application.

Bidders are requested to be present at noon, April 10, 1907, when bids for the work will be opened.

Address all communication to "THE DIRECTOR OF PUBLIC WORKS, Potenciana Building, Manila, P. I."

J. W. BEARDSLEY,

Director of Public Works.

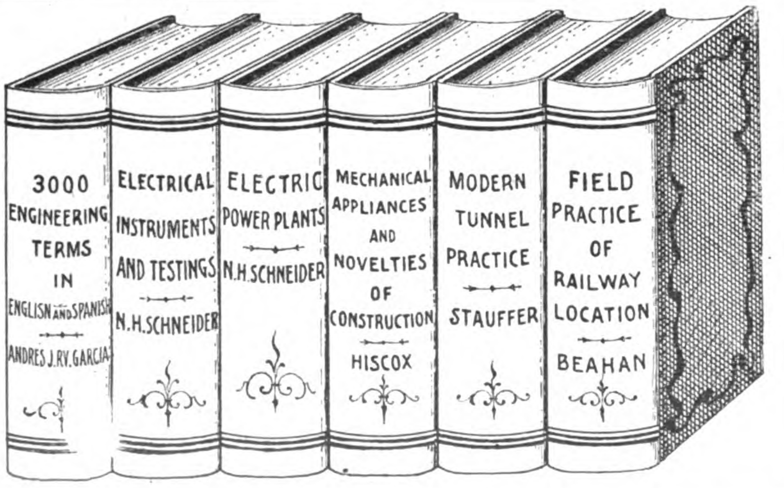
TO CONTRACTORS. Office of the Bureau of Public Works, Santa Potenciana Building, Manila, P. I., March 20, 1907.

Sealed proposals addressed to the undersigned and plainly marked "Proposal for C. A Set 126," will be received at this Office until 11:00 A. M., April 10, 1907, for furnishing all material and doing all labor required to fully complete the erection of a Provincial High School at Iba, Province of Zambales, P. I., in the manner and on the conditions set forth in the form of proposal and the plans and specifications, copies of which with other information may be obtained upon application at the office of the Director of Public Works, or to the Provincial Treasurer, Iba, Zambales, P. I.

The right is reserved to reject any or all bids or to waive any defects.

J. W. BEARDSLEY,

Director of Public Works.



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SCHEDULE

STATION	Z.	Y.	STATION	A.	B.
	P. M.	P. M.		P. M.	P. M.
Manila .... Dept.	2.40	10.00	Dagupan .... Dept.	2.55	10.00
S. Fernando .... "	4.37	11 52	Tarlac .... "	4.59	12 23
Bamban .... "	5.23	12.44	Bamban .... "	5.37	1.06
Tarlac .... "	6.15	1.41	S. Fernando .... "	6.24	2.02
		A. M.			A. M.
Dagupan .... Arr.	8.29	3.50	Manila .... Arr.	8.10	3.50
	On Saturdays only	On Thursdays only		On Fridays only	On Sundays only

These trains will stop only at the Stations named.

The accommodation on these trains will be limited to one parlor Car, 1 first Class Car new type and one second class Car for servants. The Cars are of modern design and are furnished with electric light throughout.

Servants will not be allowed to occupy the first class accommodation and must only enter the cars when necessary to attend the wants of their employers.

Mineral water and light refreshment can be obtained on Board.

Fare: First class tickets only will be issued at one and a half ordinary rate.

Baggage will be allowed at the rate of 50 kilos for each passenger.

Excess baggage will be charged for at ordinary rates.

Servants will be carried at ordinary 2nd class rates.

This Schedule will continue in force while the Philippine Commissioners remain at Baguio.

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Diphtheria antitoxin, 2000 units,	6.50
Mallein, per dose	1.00
Plague prophylactic, (Lustig or Haffkein) per cc	.30
Cholera prophylactic, (Strong) per cc	.50
Plague prophylactic per 30 cc	2.50

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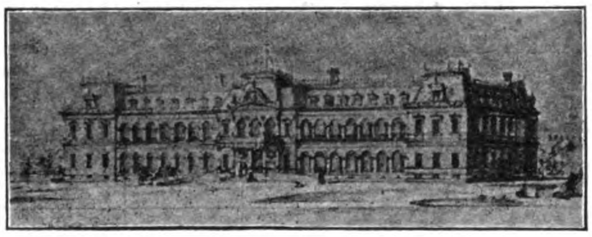
G. M. Nell, Cashier,

BUREAU OF SCIENCE, MANILA.



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Special Locomotive Works

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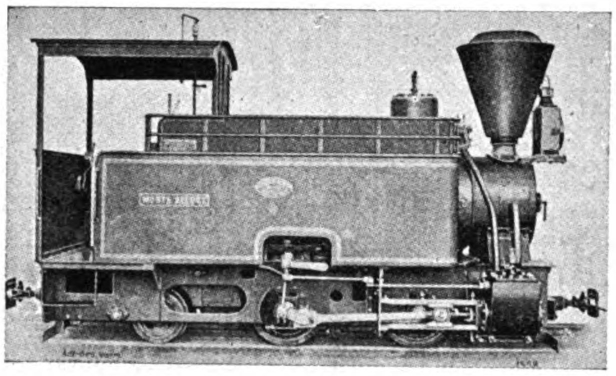

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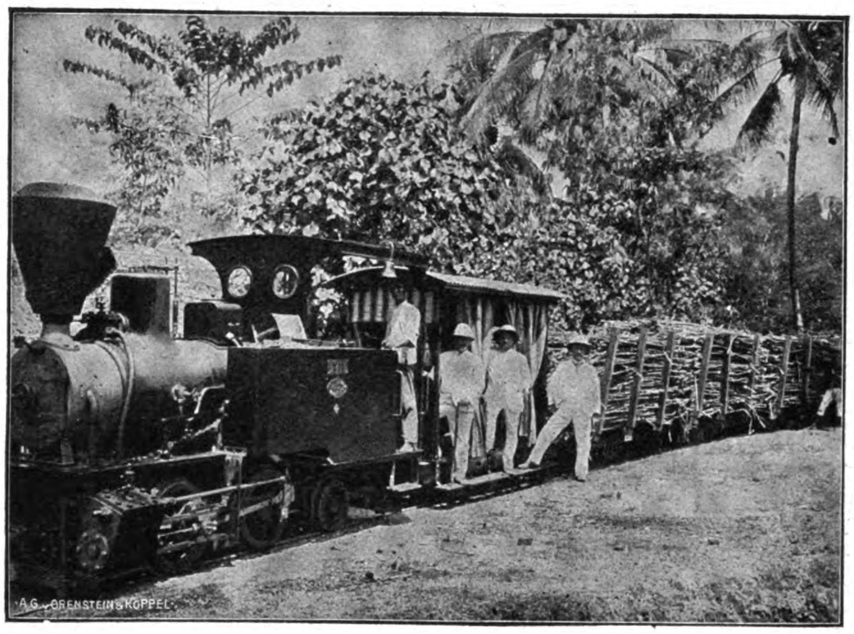

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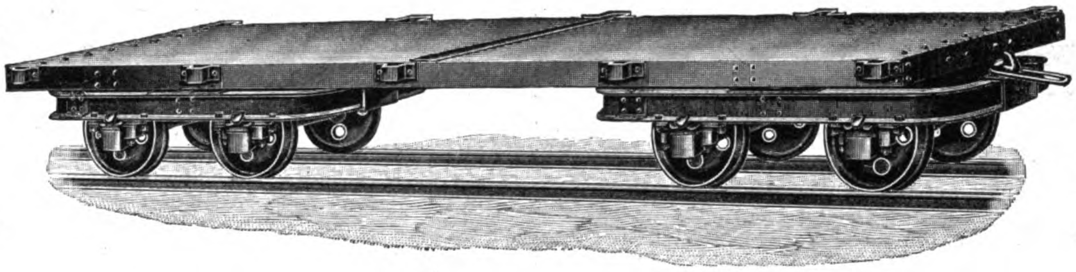

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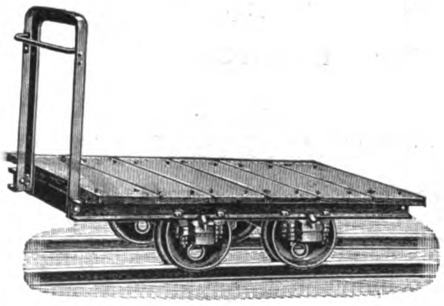

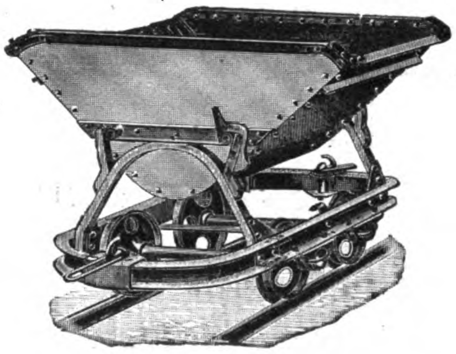

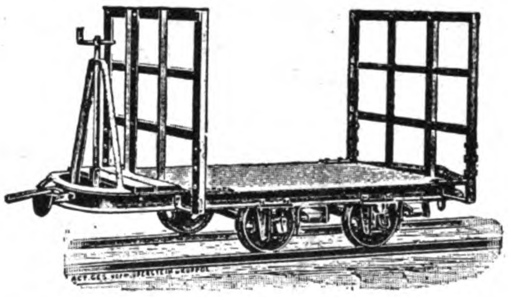

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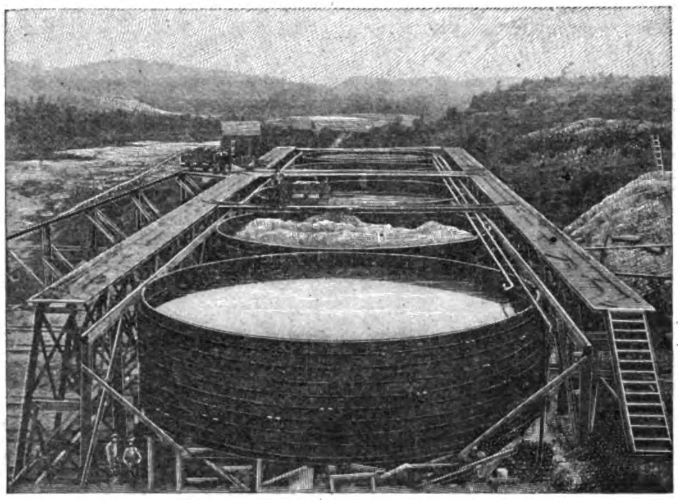

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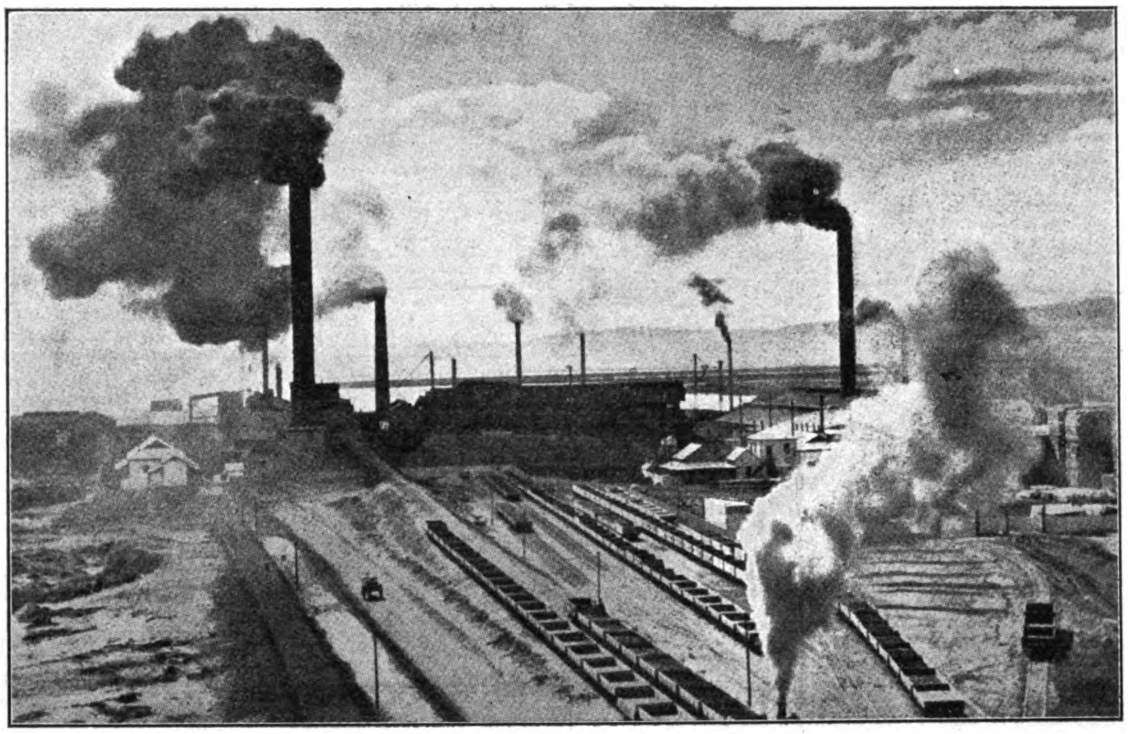
THE FAR EASTERN REVIEW

COMMERCE ⊛ ENGINEERING ⊛ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, APRIL, 1907. No. 11.

AUSTRALIA'S MINERAL WEALTH

Among all the mineral producing countries of the world Australia is entitled to an advanced place as is indicated by the remarkable output that has marked the development of the mineral wealth of that country from the inauguration of the mining industry there until the present time. In a recent special number of the *Australasian Traveller* on the subject of "Australia Today and New Zealand" much space is devoted to minerals and mining and the statistics show that Australia's total mineral production during the year 1905 was worth £25,051,421. Of this the gold production alone amounted in value to £15,559,641; silver and silver lead, £3,113,022; coal, £2,337,504; copper, £2,189,550; tin, £989,627 and other minerals, £862,077. From the inauguration of the industry until the end of 1905, the total value of the mineral output amounted to £638,839,218.



AN ADJUNCT OF A FAMOUS AUSTRALIAN SILVER MINE

The Broken Hill Proprietary's Smelters at Port Pirie, South Australia

WESTERN AUSTRALIA

Western Australia's premier industry to-day is mining—principally gold-mining, says the *Australasian Traveller.* Under the stimulus afforded by the successful exploitation of its famous gold deposits, the mining industry has out-distanced the older agricultural, pastoral, and timber export industries, though they also are of great importance, and yearly expanding. The agricultural settlers of the south had not yet penetrated 100 miles from the coast, and the pastoralists were still engaged in founding stock stations along the northern seaboard, when gold was first discovered in the Kimberley region just 20 years ago. Though intrinsically the goldfield then found was not of great value, and its situation within the tropics precluded all chance of working it profitably at that time, the Kimberley discovery was but the first step in the march of events which has placed Western Australia in the front rank of the gold-producing countries of the world. Experienced prospectors flocked in from all parts of Australia, and the early explorers' tracks were followed afresh to vast distances inland—wherever, in fact, there was known to be water or a rock reservoir noted in the map of the great riverless region.

Some idea of the extent to which the population of the State is directly supported by the wages paid to miners may be formed from the fact that last year the total number of workers in the mines above and below ground amounted to nearly 18,000. About one-third of this number find employment in the great mines of the famous centre of Kalgoorlie, where, on a strip of country six miles long and two miles wide, there are four townships and two large modern cities.

But Kalgoorlie is only the central section so to speak, of the great gold belt inland. Fifty miles further east, in a direct line, are other gold mines, with a railway in that direction twelve miles to Kanowna. To Norseman, 140 miles toward the South Coast, mines exist at intervals all the way, and there is a cry for railway connection to them, either by extending the lines built into the forest in that direction for firewood for the Kalgoorlie ore-treatment furnaces, or, more directly, by branching from the main line 25 miles further back at Coolgardie. Running northward and eastward from Kalgoorlie, the railway passes through Paddington, Bardoc, Menzies, Kookynie, Mount Malcolm, Mount Morgans, and on to Laverton—a distance of 216 miles—but still there are mining centres beyond. Burtville, 22 miles south-easterly, and Duketon, 70 miles further

(*Continued on page 343.*)

THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.

PUBLISHER AND EDITOR

COMMERCE :-: ENGINEERING :-: FINANCE

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in the Philippines and Far Eastern Countries

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MANILA, SHANGHAI AND YOKOHAMA, APRIL 1907

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The management of the FAR EASTERN REVIEW announces with regret the resignation of Mr. Robert B. Westcott, associate editor, after over two years' connection with the editorial staff.

Mr. Westcott has been closely identified with every progressive step made by the REVIEW during his association with the publication.

Mr. William Crozier, who recently resigned from the editorial chair of the *Manila American* after serving for over seven years in that capacity, succeeds Mr. Westcott as associate editor.

BLOW TO AMERICAN SHIPPING

That the American steamship companies operating in Pacific waters and endeavoring to secure a fair share of Oriental trade are discouraged goes without saying and they are no doubt embittered by the fact that even congress discriminated against the Pacific lines by striking out the provision for their benefit in the original draft of the subsidy bill. The first line affected was the Boston Steamship Co. as the management find it impossible to compete with the subsidized Japanese lines. But until the original subsidy bill was tampered with it was the purpose of the Boston people to continue their vessels in the trade on the Oriental run. Three of the vessels have already been withdrawn and by the first of June the balance will be diverted. The following Seattle dispatch gives some idea of the discouragement felt by this line upon receipt of advices there announcing the fate of the subsidy bill:

"Because, it is stated, of lack of proper subsidy encouragement, the Boston Steamship Company's vessels Lyra, Hyades and Pleiades will be withdrawn permanently from the Oriental run. The steamships *Tremont* and *Shawmut* will continue to visit Oriental ports for the present. By the first of June the other three steamships named will be diverted to another run, probably between Seattle and Nome. Frank Waterhouse, vice-president of the Boston Steamship Company, last night announced that the vessels would be taken from the Oriental run, confirming Boston despatches to the same effect. 'We had not intended to take the vessels off,' said Mr. Waterhouse, 'until changes were made in the Ship Subsidy Bill, which, we think, will be detrimental to business. We are unable to compete with Japanese lines, which have every encouragement from their government and are paid a subsidy for every mile they travel.' "

The disadvantage under which American shipping is laboring in competing with the subsidized lines of almost every maritime power, is the subject of general comment not only in the American but the foreign press and especially so since the Subsidy Bill died in the House of Representatives. The *China Critic* commenting on the fate of the bill says:

"The defeat of the Ship Subsidy Bill will, no doubt, be felt greatly by President Roosevelt, who was responsible for the Bill being introduced to rescue American shipping from its present crippled condition. Nearly all other civilized nations subsidize their shipping, Russia, China and United States being the sole exceptions. Great Britain has paid out in mail and Admiralty subsidies about $250,000,000 since she entered upon her policy in 1840. France found that her adoption of the 'free ship' policy resulted in ruinous competition to French shipbuilding, and she is now paying in mail subsidies alone about $5,000,000 yearly, and about $3,500,000 additional for construction and navigation bounties. Germany found the 'free ship' policy a failure, when she too came to the aid of the merchant marine in 1885 and is now paying over $5,000,000 yearly, which covers a subsidy of $1,047,000 yearly to the North German Lloyd for a mail service to China and Japan. The Italian subsidy and bounty system costs the Government about $3,000,000 yearly. Under the subsidy system the Japanese merchant marine increased nearly eight hundred thousand tons in less than ten years. Norway, Sweden, Spain and Austria-Hungary also pay large bounties to ship-yards and subsidies to cargo vessels. All of which goes to prove that American shipping is under a great disadvantage as compared with that of the other nations."

In the meantime the organizing of the Nippon Kisen Kaisha combine with a capital of 20,000,000 yen for the purpose of capturing the far eastern trade demonstrates that the Japanese are alive to the opportunities offered at this time. In this connection it is of interest to note the comment of the *Japan Chronicle* on the subject. That paper says:

"That one of the aims of the new undertaking is to compete severely with some of the foreign steamers trading in Far Eastern waters, possibly ousting them, there can be little doubt, and the competition between the Nippon Kisen Kaisha and the foreign shipping companies is sure to be even keener than that between it and the other Japanese concerns. The promoters point out that rice from Siam and Rangoon, sugar from Java, phosphatic rock from the Pacific Islands, etc., are all at present imported to Japan by foreign steamers, and it is such trade that the Nippon Kisen Kaisha seeks to develop and promote. So that while the competition with the existing Japanese lines is likely to be keen, the foreign shipping industry in the Far East—already hard hit by Japanese enterprise—is likely to receive a further blow by the formation of the Nippon Kisen Kaisha. The promoters anticipate success in this direction by reason of more economical working than can be employed on the foreign vessels, and also on account of the anticipated Government bounty—by which they hope to make good any losses that may be incurred."

COPPER IN THE FAR EAST

According to the *Chugai Shogyo* the copper mining industry in Japan has a bright future and submits the following table of exports and values for the last four years:

	QUANTITY. Kin.	VALUE Yen.
1903	46,024,966	14,906,033
1904	34,903,132	12,907,775
1905	34,040,107	16,048,452
1906	56,670,867	25,104,955

The decrease in quantity for 1904 and 1905 was no doubt due to the late war, during which a considerable quantity of the mineral was consumed by the Japanese naval and military authorities. A noticeable feature was that, whereas the exports for 1905 were comparatively less than those of 1904, there was a rise in prices. With the increasing market value as above, it is but natural that the output of Japanese copper should also increase in proportion. The journal therefore estimates that this year's shipment of the same will amount to about yen 35,000,000 in value.

In the Philippines, especially in Lepanto, great interest is being taken in the development of the rich deposits of copper. At the present time the Philippine commission has under consideration an application for a franchise for a railroad from the Mancayan copper district to the China sea, presented by the Lepanto Mining Company, and the promoters are sanguine that in a few years the output from their holdings there will exceed that of Japan. American and British capital is said to be interested in a company being formed to develop this valuable property.

COAL SUPPLY OF THE ORIENT

The coal supply of the Far East at present is secured in a large measure from either India, Australia, and Japan, but there is prospect that within the next few years the competition in the coal markets will be much keener if the coal fields in the Malay Peninsula, the Philippines and China in any measure come up to expectations, and sufficient capital is made available for their development.

In the Philippines the coal fields of Batan island on the east coast and the large area awaiting development in Cebu are attracting the attention of American capitalists and already the Philippine government is considering the development of the Batan mines, while the railroad companies have been looking over the deposits with a view to securing their coal supply in the islands. With what success these fields may be worked is yet a matter of some little conjecture.

Reports of discoveries in Manchuria of coal deposits and the fact that engineers are going over all the ground carefully would indicate that there is prospect of unusual development during the next few years.

At the present time the Philippines secure over 90 per cent of their coal from Australia, where formerly Japan furnished the greater part of the supply.

Commenting on the competition between Japan and India in the Far Eastern Coal markets the *Penang Gazette* says:

"Japan is at present India's only real competitor in the coal markets of the Far East; but considering the difference in the extent of the coal-fields of India and those of Japan, it is reasonable to conclude that the day is not far off when India will control the Oriental coal markets. The conclusion is based on the fact that Japan has but 6,000 square miles for coal-fields. Her present annual output is about 10,000,000 tons, which is in excess of Indian mines, but this is a small tonnage compared with what India is capable of producing. The latter has the coal, abundant cheap labor, and the capital; also convenient water transportation to the sea. The hauls by rail are short and comparatively inexpensive. This service is being supplied as rapidly as possible to meet the demands of the inland trade.

"In referring to the coal future, the Chief Inspector of Mines for India observes that the chief need for a sound development of the Indian coal-fields is improvement in superintendence and working capacity of the miner. The methods of working the mines are crude and unscientific, and this results in not only a smaller output than

should be expected but also in a great waste. To overcome this condition the Government of India has established a college, which has a large attendance, in Sibpore, for the scientific training of native engineers with special reference to coal mining. It is believed that the classes at this institution will furnish the needed skilled assistants to foreign superintendents.

"The Indian miner performs work underground much as the Indian laborer does on top of the ground. Whatever kind of labor he undertakes he brings to it an easy-going manner and bone and muscle that are far inferior to that of the English miner or the miners of America. In fact, he accomplishes less than half the results of the western miner. He has not the physique, having inherited small bones, light muscles, and an easy way from his ancestors. It is believed, however, that he is growing stronger and becoming more capable, and that in time the coal miners of India will by heredity become almost equal to coal miners anywhere, at least to those of Japan."

BLAMES AMERICA'S POLICY IN THE PHILIPPINES

The announcement that the Oriente Cigar Co. of Manila had decided to transfer its factory to Kowloon in order to have the advantages to be derived from cheaper labor, is welcomed by the Hongkong press. The *South China Morning Post*, while congratulating Hongkong on the transfer of this important manufacturing plant takes occasion to call attention to the unwise policy of the United States in extending the provisions of the Chinese exclusion law to the Philippines and maintaining a high tariff which placed a heavy duty on the cedar imported for the manufacture of the cigar boxes. This is termed by the *South China Morning Post* as "a blow indirectly dealt at a great industry by the United States government."

That paper says:

"The welcome announcement that the well-known Oriente Cigar Company, of Manila, has made arrangements for commencing business on an elaborate scale at Kowloon will be a cause of gratification to residents of Hongkong, and of corresponding vexation of spirit in Manila. So much depends upon this experiment that, in order to obtain a clear view of the basic causes which have led to the change, a brief summary of existing conditions in the Philippines may be given. Under Spanish rule, the tobacco trade of these islands flourished, and Manila cigars became famous throughout the world for quality and cheapness. The revenue was large and the trade afforded profitable employment for thousands, besides stimulating the cultivation of the leaf. When the United States Government acquired the islands, a new and unfortunate era for the tobacco manufcturers began. A high tariff wall maintained the landed cost of such necessary material as the cedar used for boxing the cigars, and an internal revenue tax took away a large slice of the manufacturers' profits, and its method of collection has become also a constant 'vexation of spirit.' In addition, the Filipino found that there was money in politics, and dignity and a competence awaiting him behind shop-counters. Chinese were excluded, and the very natural result was that the price of labor became much dearer. If cheap labor could have been obtained, the problem would have been less difficult, but the exclusion laws and regulations have now put an end to any hopes of relief. The inevitable result of this has been a heavy increase in the cost of production, and consequent diminution of profits. If the public would continue to smoke as many dear cigars as they formerly smoked cheap ones, then the problem would be solved, but such a glorious freak of human nature can only be conceived in the imagination. The blow indirectly dealt at a great industry by the United States Government has resulted in the transfer of one of the principal factories from Manila to Kowloon. A large piece of land near the Steam Laundry, has, we understand, been acquired and a modern plant will be installed. As an experiment Filipino workmen will probably be imported, but if the cost prove too heavy, or other difficulties arise, the Oriente Company may train and utilize Chinese labor. As all the material can be imported free of charge, and a great market lies at the door of the factory, the enterprise of the company should be amply rewarded. If the United States authorities place a prohibitive export duty on cigar leaf, then the leaf will be obtained from Java or Cuba or elsewhere. It must be a matter for hearty congratulation to the community of Hongkong that the near-sighted policy of the American Government has driven the Oriente factory to our shores, and there are many who confidently expect that, with the success of the 'Hongkong Cigar' and the continuance of the vexatious policy in Manila, the bulk of the Philippine cigar factories will find a more congenial habitat on British territory. Such a consummation is devoutly to be desired from the point of view of those who have at heart the increased trade and prosperity of this colony."

THE TRADE OF PORTO RICO

The Far East journals, *Okraina* and *Dalny Listok*, publish some information concerning the activity of the Japanese in the southern portion of Saghalien. Thus, on December 6, the railway between Korssakovski and Vladimirskoye was opened. This line, which is only of a temporary character, has cost $135,000; it is 30 miles in length and has six stations. At present nearly all the places in South Saghalien are connected by telegraph. The Japanese Government has decided to intrust the civil administration of Karafuto, that is, Saghalien, to the ministry of the interior and not to the ministry of war, and a colonial department for administering Karafuto, Hokkaido, and Formosa will be formed in the ministry.

JAPANESE DEVELOPMENT OF SAGHALIEN

Figures issued by the Bureau of Statistics of the Department of Commerce and Labor show that the trade between the United States and Porto Rico in the calendar year 1906 will exceed $40,000,000 against less than $4,000,000 in 1897, the year before annexation.

The value of merchandise sent from Porto Rico to the United States in the ten months ending with October, 1906, is $19,320,137, and of merchandise sent from the United States to Porto Rico in the same period $16,509,946, making a total for the ten months of $35,830,083, and thus giving apparently good ground to expect that for the full twelve months ending with December the total will be found to be more than $40,000,000. In the calendar year 1897, the year immediately preceding annexation, the total imports into the United States from Porto Rico were $1,943,251, and the total exports to that island $2,023,751, making a total of $3,967,002, or less than one-tenth of the total estimated for 1906.

In 1896, 14 per cent of the exports of Porto Rico came to the United States and 21 per cent of its imports were sent from here, but now about 87 per cent of the trade in both imports and exports is with this country. At the same time its total trade has nearly doubled.

AMERICANS SUPREME IN MANCHURIAN TRADE

W. A. Graham Clark, United States special agent, writes the following report upon his return from a trip through Manchuria, undertaken for the purpose of getting behind the scenes and obtaining direct information as to the conditions that are at present blocking American trade there:

Manchuria is a very important market for American piece goods. It is the one section of China in which American piece goods practically monopolize the market. Of the cotton piece goods imported over seven-eighths of the total number of pieces are American. The trade of Manchuria is of more importance to the United States than to any other nation with the possible exception of Japan.

Finding some $50,000,000 worth of cloth stacked up at Shanghai, a great part of it American, and that—though not the sole cause—one main factor was the lack of buying from Manchuria, I went north to study the country, ascertain if the slack demand was due to the effect of the war or to other causes and to see what stocks were held in the interior and what prospect there was of an early resumption of active business for our mills. Every point of importance to American trade interests south of Harbin was visited.

AMERICAN STOCKS HEAVY.

According to the best information obtainable, the stocks of piece goods at the main points in Manchuria in November, 1906, were found to be as follows:

	Piece-goods stocks in bales			Stock yarn in bales, Indian and Japan
	American.	Japanese.	Chinese.	
Nieuchwang.....	20,000	3,000	10,000	800
Mukden	2,000	3,000	1,000	600
Tieling...........	1,000	2,000	1,000	500
Kwanchengtze..	15,000	300	10,000	500
Kirin............	25,000		20,000	1,000

These approximate figures are fairly correct. As shown in the table, the stocks of American goods now on hand at the five main points are some 63,000, and, allowing 12,000 as covering the stocks at Hsinmintun, Chang-tu-fu, Liaoyang, and all the other smaller places throughout Manchuria, the total stock of American goods on hand is probably in the neighborhood of 75,000 bales.

For the four years previous to 1905 there was an average of 1,920,077 pieces imported annually, which, in bales, would be approximately 58,000. In 1905 there was imported 3,890,769 pieces, which was approximately 114,000 bales. There was thus imported in 1905 a two years' supply. Assuming that the normal stock in the country at this time of year is 50,000, there are 25,000 bales, or six months' supply above the normal, now on hand. Adding to this the larger Chinese stocks and Japanese stocks, a new factor, there does not seem much chance of new business for American mills until the present stocks are absorbed. This is the view taken by the large Chinese merchants, none of whom expects to send many buying orders to Shanghai before fall.

INCLUDED WAR SUPPLIES.

The Japanese stocks of 8,300 were put down as estimated by Chinese merchants and by Japanese agents, but seem large, in view of the fact that the Cotton Cloth Export Association was only formed in May, and was to export 1,000 bales monthly, or 12,000 a year. In September and October, however, they imported much more, the total bales coming forward direct from Japan being 3,082 and 2,676 bales, respectively, for the two months.

Even then their stock of probably more than 10,000 bales, considering stocks at all points, seems disproportionately large. and can only be explained by considering that before the Cotton Cloth Export Association was formed by the Mitsui Bussan Kaisha there was a large quantity of cloth brought in under the head of "war supplies" and put into the channels of trade. As the "Man on Donkey" chop of the Miye Mills, and the "Standing Horse" of the Osaka Mills are still on the market here, and were known to the trade before the two and three other mills' cloths had stamped on them the "Two Cubs" chop of Mitsui, this is probably the explanation.

Both the Japanese and American bales of sheetings contain 800 yards of 36-inch cloth, while bales of drills are 600 yards of 30-inch cloth. The Chinese bales are more variable, but contain approximately 675 yards of cloth, 14 to 18 inches in width. There was a big increase in shipments of this cloth into Nieuchwang in 1905 over 1904, the increase being $2,242,640 (gold) in value. Like other cloth, however, this native-made cloth has experienced the effect of the depression, and the stocks on hand are larger than usual.

CHINA'S COPPER SUPPLY

The Chinese Government realizes the great demand for copper that exists by the provincial mints for the manufacture of bronze coins of different denominations, and that up to the present China depends upon foreign supply. It has therefore been decided to appoint a special high commissioner who is to reside in Yunnan, the great copper producing province, and who will also have jurisdiction over the mines of Kiangsi, Kuangsi, Hunan and Hupeh. This step is considered as a preliminary measure to the opening up of the vast mineral wealth of these provinces.

PENANG HARBOR

A report has been laid before the Legislative Council on Penang Harbor Improvements. It is a report from Messrs. Coode, Sons & Matthews. The recommendations are the extension of Swettenham Pier, 345 feet to the northward, and 255 feet to the southward (giving thereby 1,200 feet in all); widening Weld Quay for a length of 860 feet; widening the inner end of the railway Pier; and forming a widened road in front of the Government Offices, at a total cost of £119,000. Full advantage cannot be taken of the northern extension until the reclamation and cargo godowns are completed. Pontoon landing stages are provided at either end of the extensions, and an additional road to the northern port of the Pier.

The report mentions Mr. Huttenbach's comprehensive scheme for Harbor Improvements, an island pier 1250 feet in length and 210 feet wide, with a viaduct of 1080 feet from Church-st. Ghaut. This was the scheme proposed by Sir John Coode as likely to cost £333,000 in 1891, but the cost now would be decidedly more.

HONGKONG SUGAR IMPORTS

During 1906, 483,119 tons of sugar were imported into Hongkong. Leaving out the odd hundred-weights, quarters and pounds the sugar comprised in this amount came from countries as follows:—

Austria, 120; Belgium, 426; China, 17,262; Cochin-China, 3,214; Germany, 40,567; Java, 314,673; Japan, 223; London, 334; Mauritius, 24,832; Philippine Islands, 75,986; Straits Settlements, 5,322; New Territories, 154.

FORMOSAN SUGAR

Consul Julean H. Arnold writes from Tamsui that the production of sugar in Formosa is increasing year after year.

The season for 1906 showed a production of 159,000,000 pounds of brown sugar and a total of 178,500,000 pounds of all grades. This is 50 per cent greater than the production of 1905, while in eight years the production of sugar in Formosa has shown a growth of 90 per cent. Formosa sugar is admitted to Japan free of duty, although an export duty is imposed upon this sugar when exported from Formosa to foreign countries. The 1906 exports from Formosa to Japan exceeded those of 1905 by over $1,160,000 gold, being equivalent to about 15 per cent of Japan's total consumption. As Japan proper produces no sugar, it is plainly evident that the recent increase in import duties is intended to assist the Formosa industry.

A Sugar Bureau has been created under the charge of Doctor Nitobe, a well-known economist, who has been making a special study to improve and extend sugar-cane culture in Formosa. Shoots for planting have been distributed free of charge to growers. That the growers have taken to the introduction of improved canes is attested to by the fact that in 1903 there were 2,520,000 shoots distributed among them, which increased in 1906 to 15,410,000 shoots, so completely exhausting the supply of the Bureau that purchases had to be made from private nurseries.

Improved fertilizers have been introduced. Among the new fertilizers in use are goose bone dust, Australian bone dust, and Manchurian bean cake. The importations of bean cake in 1903 were 154,835 pounds and during 1905, 477,756 pounds. Peanut-oil refuse was also imported for fertilizing and used to the extent of 149,040 pounds in 1904, but has not been popular because of its higher cost. It is expected that the use of artificial fertilizers will continue to increase as the development of the sugar-cane industry advances.

BONUSES AND SUBVENTIONS.

To assist and encourage the growing and the manufacture of sugar, the Sugar Bureau grants bonuses and subventions to growers and manufacturers. In the southern part of the island there is considerable land belonging to the Government which is adapted to the cultivation of sugar. In order to bring this land under cultivation, the Sugar Bureau is empowered to grant to prospective growers the following bonuses: For plants, a sum not to exceed $1.80 gold for each one-tenth ko (1 ko=2.43 acres); for fertilizers, a sum not to exceed $2.50 gold for each one-tenth ko; for cultivation expenses, a sum not to exceed $1 gold for each one-tenth ko. After ten years of successful cultivation the grower is entitled to a title deed conveying to him the land cultivated by him. For irrigation and drainage works, before any such may be undertaken, application must be made to the Government, upon the granting of which the Government empowers the Sugar Bureau to defray an amount not greater than 5 per cent of the total cost of the undertaking. Up to 1904 the Sugar Bureau was empowered to dig artesian wells and undertake drainage systems, and it spent $7,117 gold in so doing. The total area under cultivation now as compared with the area under cultivation in 1902 is about double, the area at present cultivated being estimated as 88,000 acres.

METHODS OF MANUFACTURE.

In 1900, the agricultural section of the Formosan government, with the aim of introducing modern methods of manufacture of sugar in the island, installed two American crushing mills. It was soon shown to the Chinese producers that they might secure 20 per cent more juice by the use of these rolls instead of the antiquated Chinese stone crushers. After the creation of the Sugar Bureau, a number of these rolls were introduced to displace the stones. The efficiency of modern machine methods over primitive native methods has been amply demonstrated. For several years the Sugar Bureau was empowered to grant subventions to companies erecting sugar factories, basing these grants on the amount of capital invested. Since 1904 bonuses have been granted upon a basis of 20 per cent of the purchase price of the machinery. Since the establishment of the Bureau $380,348 gold has been distributed in bonuses to factories.

When a new company wishes to engage in the manufacture of the crude sugar, it must file an application with the Sugar Bureau, through the prefect in the district in which it desires to operate, stating in this petition full particulars as to its working capital, proposed capacity, etc. In case the Sugar Bureau grants the application, it designates certain areas from which this mill may secure its cane. No company is permitted to purchase cane in any other than the district assigned to it unless by special grant from the Sugar Bureau.

The growers, in turn, are obliged to sell their cane to the mill operating in their respective districts, unless granted special permission from the bureau to do otherwise. Thus, competition in the buying and selling of the sugar cane is barred. The price paid for the cane is determined by the company making the purchase. In case the growers are dissatisfied with the price offered they may lay the matter before the district prefect, whose duty it is to effect an arbitration between the company and the growers.

It is the duty of the prefect of each district to keep in touch with the conditions obtaining in their respective prefectures as regards any tendencies on the part of the mills to take undue advantage of the growers, and report such to the chief of the Sugar Bureau. The mills are obliged to send to the Sugar Bureau regular reports setting forth complete statements of their operations, prices paid for materials, sales of sugars, prices realized, etc.

OFFICIAL REGULATION.

In this manner the Sugar Bureau regulates the industry, and is able to render to it such assistance as it finds practical. A large number of these mills control the land upon which much of their cane is raised, renting it to growers and advancing to these money and materials sufficient to carry on the growing of the cane at a small profit to them. In other cases the manufacturers arrange at the beginning of each season with the growers, fixing a certain price to pe paid for the cane, and advancing money against the crop upon the fixed price basis. Most of the mills have agents in Japan who contract to take their products for the Japanese refineries Practically all of the refining is done in Japan.

The prospects for the erection of a number of new mills of large crushing capacity are quite bright. In fact, several large companies have already organized and are preparing for the erection of their plants as soon as they are able to secure the necessary machinery and equipment. One crushing company has a capital of $2,500,000 gold, another has increased its capital from one-half million dollars to five times that sum; another half million dollar one is organizing, and there are many smaller concerns making up an aggregate of $10,000,000 capital either invested or about to be.

FAR EASTERN TRADE NOTES

China is now shipping goods to the province of Tibet via the sea route, through Calcutta, says the *Indian Trade Journal*. The old overland route via Batang to Lhasa is in a disturbed condition.

Freight rates from Ceylon to the United States are: On rubber, $12 a ton; tea, $8, and all other articles, $7.85.

It has cost the Queensland Government and citizens $6,250,000 to erect and maintain rabbit proof wire fences to control the rabbit pest. Although very large, it is considered a wise outlay.

The Queensland State Government tobacco expert, who is an American, after successful sample crops, has decided to promote the cultivation of leaf tobacco.

Queensland's vegetable and fruit industries have assumed large proportions. The product is now $5,000,000 a year, but large importations continue, such as potatoes, $488,000; apples, $250,000, and onions, $163,000.

Burma's rice fields embrace nearly 10 per cent of the total area under rice in British India. The area amounts to 6,966,215 acres, which is an increase of 252,833 acres over the previous year. The floods of September and October destroyed 181,556 acres and the number left fallow was 543,096 acres.

The enormous increase in the export of goat skins, cow and buffalo hides from India is causing a great deal of comment by merchants interested in the leather trade of India, says Consul-General Michael of Calcutta. The United States takes nearly all of India's exported goat skins.

Japan's six sardine factories are to be increased to thirty during 1907.

Japan's exports of porcelain ware to the United States are increasing rapidly. They were about $2,800,000 worth in 1906, against $1,900,000 worth in 1905 and three and one-half times as much as in 1902.

Exports of tea from India in 1906 amounted to 214,000,000 pounds, and may reach 225,000,000 pounds in 1907. The total was 181,000,000 pounds in 1903, says the *Indian Trade Journal*.

New Zealand's revenue for the current fiscal year will reach $41,500,000, yielding a surplus of $3,500,000.

The Japanese consul at St. Petersburg is actively moving to establish a Russo-Japan Trading company, and also a Russo-Japan Bank. The company is to import Japanese products into Russia and to export Russian products into Japan. Museums of samples are to be established in St. Petersburg and three other large Russian cities and also in the Siberian trade centres.

"To-day," says Lord Redesdale, "Japan's finances rank with the best in the world. When Japan made her first appearance in London as a borrower she had to pay the Oriental Bank twelve per cent interest on a loan of $5,000,000. In many features of material progress Japan has outstripped her teachers The old Japan is dead, but its spirit of patriotism and chivalry survive."

One thousand Japanese laborers have migrated to Mexico, and 2,000 will follow shortly. They are chiefly employed in railroad construction.

The Japan-Siam ship service will speedily increase the $5,500,000 annual trade which now exists (equally divided) between the two countries.

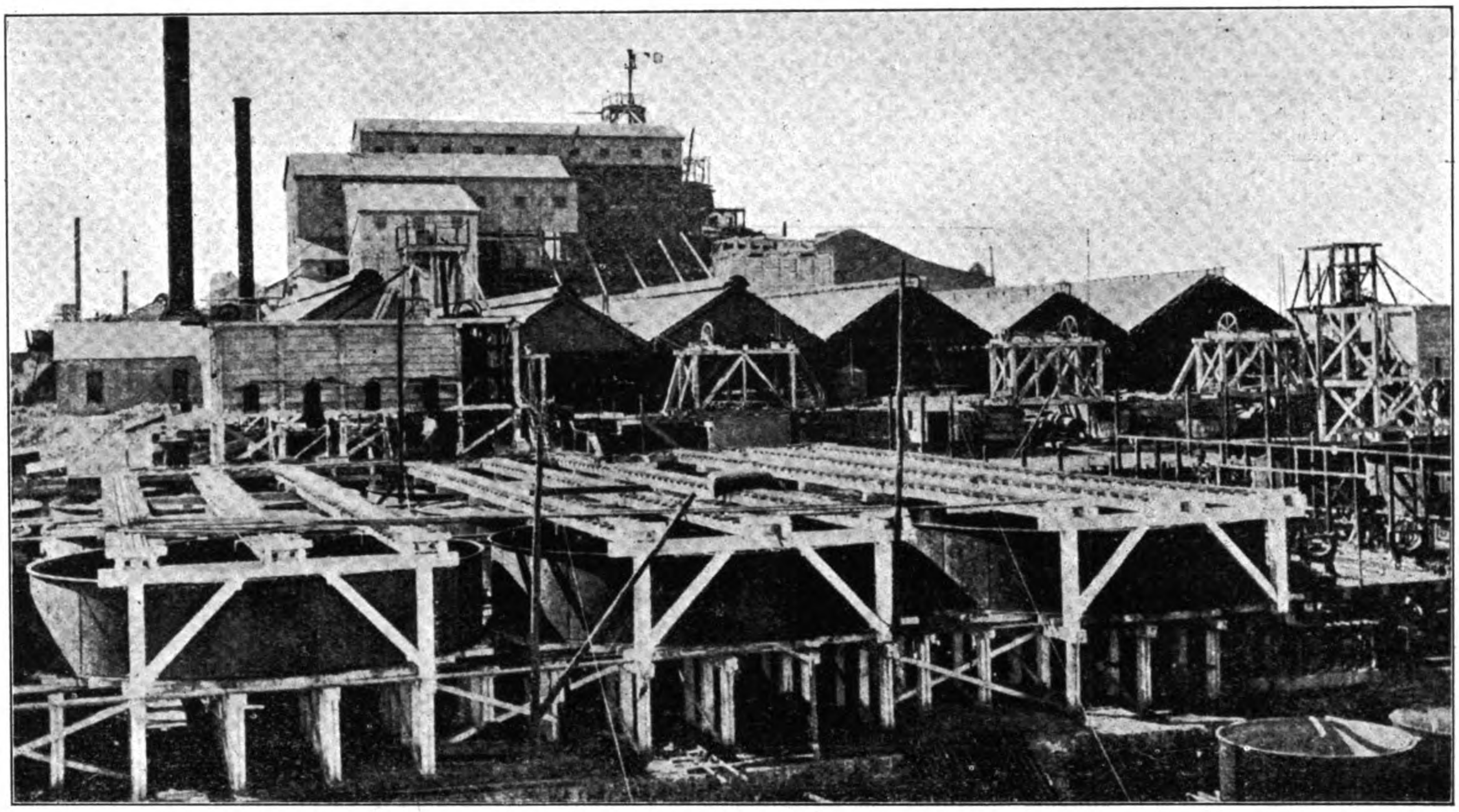
Japan's trade with China has increased by sixty per cent in two years.

AUSTRALIA'S MINERAL WEALTH

(Continued from page 339.)

north, are both producing centres, and at each place government enterprise has erected a state battery for crushing the stone won by the small leaseholders and prospectors. West of the line at a point nearly opposite Menzies, the Davyhurst district has now become fully established.

From the northern railway system, which runs from Geraldton inland to Nannine, there is a similar succession of mining centres lying outside present railway communication. The railway first strikes the gold-mining belt at Yalgoo, 139 miles from the coast. Thence onward it serves the rich region of which Lake Austin is the central part. The Mount Magnet district to the south of the lake is an important one, but it has been completely dwarfed by the wonderful Great Fingall mine at Day Dawn, near Cue, on the north side. On either side of the railway extension to Nannine new districts have become established, and are yearly growing in importance and outputs. West is the Meekatharra field, and eastward is the Black Range. Beyond the latter is the new field of Barrambie, discovered while the rabbit-proof fence was being erected. East of Barrambie again is the far-out centre of Lake Way, of Wiluna, from which point the monthly gold escort sets out for Perth, gathering on its way down the gold outputs of the more southern fields. North from Nannine and 70 miles distant, is the one-time famous Peak Hill centre, now temporarily under a cloud owing to financial difficulties, in which the principal company operating there has become involved. From Peak Hill there is a break in gold-mining until the watershed of the rivers draining to the Nor'-West Coast is reached, and then begins the rich belt of the Pilbarra goldfields. Westward of the route, and at the head of the Ashburton River, is the Bangemall centre, which is at present idle; the distance from the coast and difficulty of obtaining supplies being, for the value of the reefs, prohibitive. South of Yalgoo, mining operations are being carried on at the Baron Rotchschild mine; but, speaking generally, the country between thortherne n and the eastern goldfields railway systems has not yet seriously attracted the attention of capitalists, though adventurous prospectors have located gold-bearing reefs at many points therein.



MODERN GOLD MINING IN WESTERN AUSTRALIA

The Australia Associated Mine, Kalgoorlie. Cyanide Vats in Foreground.

THE MINERAL BELTS.

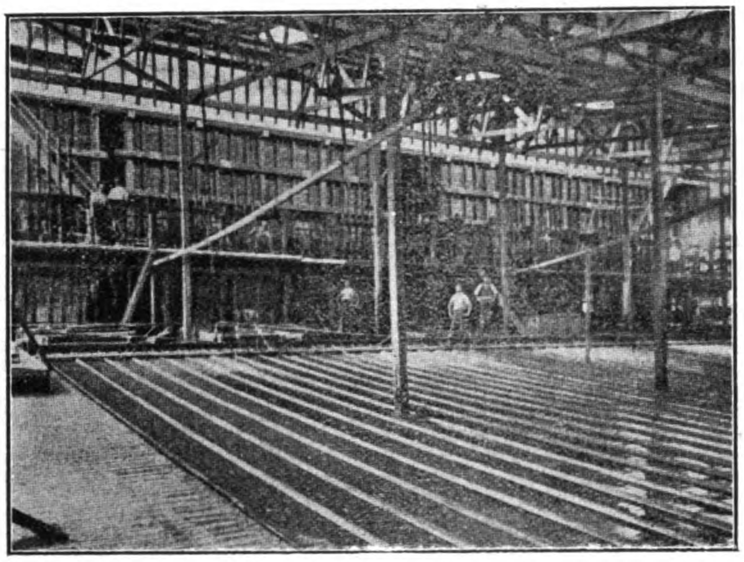
While the above brief survey gives a concise idea of the present developmental stage of the different goldfields, it is well to remind the reader that it has not even sketched out the mineral-bearing portions of Western Australia taken as a whole. The goldfields are on a belt of upland which has an altitude of from 1000 to 1500 feet above sea level, and is fully 200 miles broad. This belt runs, practically unbroken, from the South Coast, east of Albany, to the tidal ports of the Nor'-West Coast—a distance of more than 1000 miles. Eastward of this belt—but 400 miles nearer the equator, and forming the northern section of the State—is the Kimberley mining region. The gold-bearing rocks there are near the boundary line separating this State from the Northern Territory of South Australia. Mineral-bearing rocks extend all along the north watershed of the Fitzroy River, and run northward along the coast inland from Derby. In this latter section the silver-lead and copper deposits near Derby have lately attracted much public attention. Between the Fitzroy River basin and the North Coast is an immense area of rocks containing fossils of the carboniferous age, and though no coal beds have as yet been located in the series, there is little doubt that, when closely examined by geologists, such will be found. Separated from the goldfields highlands by the ranges which overlook the West Coast, there is yet another mineral belt, relatively narrow, but of great length. It commences in the Cape Leeuwin Peninsula, and runs right up to the Northwest Cape. Tin, tantalite, copper, lead, and graphite, occur in the lower rocks of this belt, and coal in the series of younger rocks resting on them. The earliest mining in the State was done at the copper and lead mines in this belt near Northampton, which now has railway connection with Geraldton. Later, the discovery of alluvial tin at Greenbushes added largely to the wealth of the State, and, later still, the discovery of beds of coal in the sandstones of Collie—some 40 miles nearer Perth than Greenbushes—established yet another branch of mineral industry. The southern railway system connects both of these mining centres with the capital, and with the ports of Vasse and Bunbury. The long stretch of this belt, which lies between Perth and Geraldton, is traversed nearly throughout by the Midland Railway Company's private line, and the soil is deep and sandy. Towards the northern end, and at Minginew, coal-bearing rocks of true carboniferous age are met with, but a payable seam has not yet been located. This series of carboniferous rocks is of great extent northward, as fossils from it have been obtained from near Bangemall (120 miles inland from Sharks Bay), and artesian waters have been struck in it by a bore 2000 feet deep at Carnarvon, on the shore of the bay itself.

THE ECONOMIC POSITION.

Turning to the economics of Western Australian mining, the State holds a world's record. The laws of the land do not permit of the employment of any colored labor on the mines, and the wages ruling (fixed by Arbitration Act awards) are from £3 to £4 per week, according to situation and local circum-

stances. Firewood for the supply of the steam plants and the treatment works at the largest centres is brought distances varying from 20 to 75 miles. Water, as previously mentioned, is brought from the coast to the large centre of Kargoorlie and the other places *en route* by Government pumping installations. At many other centres local government water supply systems have been established, but in the majority of the smaller centres the dependence for water is still on the salt basins in the neighborbood of the mines or from the workings of the mines themselves. For domestic purposes in the latter case the water has to be condensed, and each employee is supplied with a daily ration of two gallons from the company's condensing plant, free of charge. The climate is too dry for vegetables and fruit to be advantageously grown, and most of the necessaries of life (and practically all mining supplies) have to be brought from the coast. Much of the gold ore obtained from the mines, now that they are attaining considerable depths, is complicated with telluride and sulphur, and requires special treatment, either by roasting at the mine, or by concentrating the sulphide portions and despatching them to smelters or other treatment works. Yet, despite all these conditions, the 1199 gold-producing properties in this State turned out last year 1,955,316 fine ozs. of gold, valued at £8,305,604. The average number of tons of ore raised per man employed underground was 291 tons, yielding an average of gold equal to 200 ozs. per man. To the 54 large mining companies operating gold mines here—companies almost exclusively domiciled beyond the seas—the sum of £2,167,-639 was distributed as dividends. Their mines produced 1,497,205 ozs. of the total gold yield of the State, and this was obtained from 1,518,-322 tons of ore crushed and treated. So thoroughly has labor been organized, and its efforts so well supplemented by the introduction of high-class machinery, that it has become possible now for many mines—as proved by the dividend list—to carry on remuneratively with ore worth less than *thirty shillings* per ton. The average value per ton treated throughout the State last year was £2 18s. 6d.—a figure which, when compared with the higher rates of earlier years, has lent some support to the interested statements circulated of late that the mines grow poorer with depth. The statement is only true with a very material qualification. The tonnage treated shows conclusively that a very different system of mining obtains now than formerly. Every ounce of stone containing gold is now sent to the mill, instead of being discarded in favor of the rich stone only. This naturally gives a poorer showing per ton; but the fact that the profits made on it are even greater than of old—as testified by the dividends paid—is proof positive that the lodes are carrying their riches downward. The deepest mine in the State is the Great Boulder, now down 1950 feet. At the 19th level there is now a run of ore from 6 feet to 40 feet wide, showing for a length of 700 feet—viz., from opposite Edwards' shaft, to a point 170 feet north of the main shaft. The average value of this run of ore is rather more than 15 dwts. per ton; in places it ranges up to several ounces. There are some twelve or fourteen other mines in the State well below the 1000-feet level, and, in brief summary, in may be said that no mine in the State working a true lode deposit has yet bottomed its wealth.

The method of treating the complex ores of Kalgoorlie is crushing and roasting, followed by fine grinding with mercury, then stirring for a number of hours in cyanide solution vats, and filter-pressing. The compressed filter cakes are returned down the mines for stope-filling, and the gold is extracted from the solution by the ordinary method of precipitation by zinc shavings. Some of the Government batteries (of which there are 30 in all) are equipped with the cyanide adjunct, but where it has not yet been installed, the Government buys the tailings from its customers, at a rate determined by the assay values.



UP-TO-DATE KALGOORLIE, WESTERN AUSTRALIA

The 100 Head of Stampers at the Ivanhoe Mine.

MINERALS OTHER THAN GOLD.

The economic conditions of gold-mining apply equally to the other branches of the mineral industry of the State, modified by the fact that, as a rule, the deposits are more or less contiguous to the coast.

Copper is mined at Ravensthorpe, and the mines there are likely to be worked on an extensive scale in the near future. The belt is twelve miles in length. Two years ago the Government, in pursuance of a fostering policy, erected a smelter there. The results were so satisfactory that an English syndicate acquired the mines, and after further developing them for six months, have formed a powerful public company to work them. Including the first cost of the properties, they have now laid out some £60,000 on the field and have also bought, outright, the smelting plant, for which the Government have now no further use.

Lead. The lead mines at Northampton are mostly the property of the Fremantle Smelter Co. Limited, and it was recently announced that measures were being arranged to reopen them consequent on the outlook for the market in lead and zinc.

Tin has now become one of the State's chief products. Much ore is at present exported for treatment, but the Fremantle Smelting Works are now equipped for treating it locally. Of the four producing centres, three—viz., Moolyella, Cooglegong, and Wodgina—are in the Pilbarra region; the fourth, and oldest, is at Greenbushes.

Tantalite, an ore of the new metal tantalum, occurs with the tin ores in this State to an extent unequalled in any other part of the world. The market is, however, a very limited one as yet, but must hold a big future in store for the deposits in Western Australia.

Rare Minerals and Gems. A region so extensive as this State must necessarily have a due proportion of all the minerals which go to help forward man's civilization. Many of the so-called "rare" minerals are already known to occur, but the incentive to their exploitation is as yet wanting. Gems, too, such as diamonds, are on record, but the finds have no commercial significance at present.

Coal. It is unfortunate for the State that its only developed coalfield does not produce an article of export quality. Geologists are divided in opinion as to whether a superior coal is likely to be found in the Collie basin to that now worked there, but meanwhile the State coal has done the country much valuable service.

MINING LAWS AND STATE POLICY.

The mining laws of the State are liberally conceived and administered. The broad, underlying principle is that all lands leased for mineral purposes shall be legitimately and actively worked. Full provision is made for relief from working conditions when satisfactory cause is shown to the Minister for Mines that such relief is necessary. New legislation is now under discussion in Parliament to give still more easement for conditions which the light of past experience has shown to be expedient. The State helps liberally any mining venture which, in the Minister's opinion, stands only in need of a limited financial assistance to prove some particular point in its mine, or ore value.

The State batteries dotted over the different fields are collectively responsible for an addition of over 7000 tons of ore to the monthly crushings. By their aid the prospector with only a few tons to crush is as well catered for as those mines which send larger parcels to plants for treatment.

NEW SOUTH WALES

The evidences on all hands of the prosperity and material progress in connection with the great mining industry constitute one of the brightest spots in the national outlook. The output of metals and minerals represents about one-sixth of the annual primary and secondary production of the State. In plain official figures, the value of the metals and minerals produced in New South Wales in 1905 was

£7,085,893, being an increase of £694,129 over the production for 1904, and considerably eclipsing all previous records. That the returns for 1906 will show a further substantial advance is already beyond all doubt. The exports of silver, lead, copper, tin, and coal alone for the first half of the year represent in value an increase of 15 per cent.

SILVER.

The wonderful group of Broken Hill mines, which have in the last 20 years turned out some £45,000,000 worth of minerals, and paid £13,500,000 in dividends, have furnished the most interesting and solid evidences of progress. The mines are developing well at depth—the big ore bodies in the case of the Proprietary mine being proved down to 1,200 feet—extractions are being improved, costs reduced, and, above all, the zinc contents of the current ore supplies and the vast accumulations of tailings are being turned to profitable account, all of which goes to assure the stability of the field. Profits will be largely augmented by the treatment of the zinciferous residues, preparations for which on a big scale have been entered upon, notably by the Zinc Corporation Limited, which has bought approximately 2,000,000 tons in the dump and contracted for a further 4,500,000 to 5,000,000, spread over nine years. The ore reserves and tailings on the field are estimated at £80,000,000 to £90,000,000 gross, and the remodelling of the mills to double, in some instances, the quantities of crude ore treated is in progress at nearly all the mines. Altogether, it looks as if Broken Hill had fairly entered upon a new cycle of prosperity.

COAL.

The coal industry of New South Wales is too well known to require more than a short notice. Briefly put, this State is par excellence the "coal" State of the Commonwealth, which may be gathered from the fact that while the total coal product of the States in 1905 was £2,337,504, New South Wales accounted for £2,003,461 of this amount. Thousands of miners are employed in the famous Newcastle district and further south. The total coal product of the Commonwealth from the inception of the industry has been £53,919,213, of which New South Wales has contributed £48,019,516.

COPPER.

A great impetus has been given to copper mining by the high prices which have ruled for the red metal, and the value of the output for 1905—viz., £527,403—is likely to be increased by 50 per cent at least this year. The most notable recent event has been the sale for £800,000 cash of the Great Cobar Copper Syndicate's mines and allied assets to the Great Cobar Limited, an English corporation, whose avowed intention is to treble the mine's present output of 4,000 tons of copper per annum. It is easy to grasp the importance of this to the State. Other copper properties in the district —notably, the Queen Bee—promise well, and the Lloyd mine at Burraga, which yields about 1,800 tons of copper yearly, will also probably become a bigger producer.

A GOLD INCREASE.

The gold yield for 1905 was £1,165,013, as compared with £1,146,109 for the previous year, and £2,660,946 for the record year—viz., 1852. The output for this year will show a substantial increase over that of 1905. No new fields of importance have been opened up, but there has been more general activity. The gold-dredging industry, incepted some eight years ago, and which last year yielded £136,090, is assuming steadily increasing importance.

OPALS.

The opal is the most characteristic of Australian gems, and is obtained abundantly from the famous White Cliffs district, in northern New South Wales. Over 1,000 men are employed in the industry, and the area covered by their operations is about twelve miles by two miles wide. The output for 1904 was worth about £57,000.

TIN.

The development of tin dredging has latterly been a conspicuous feature, and the success which has attended this method of working "old" and otherwise unpayable ground has opened up a new and very important industry. No less than 26 dredging plants are now operating successfully in the Tingha and neighboring districts, and numerous others are in coursse of construction or projected.

SHALE.

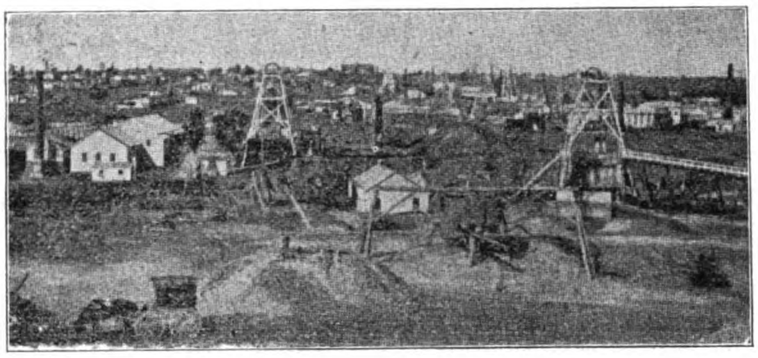
In connection with the kerosene shale deposits, the Commonwealth Oil Corporation Limited, floated in London with a capital of £800,000, is now developing extensive properties in the Capertee and Wolgan Valleys, which it is anticipated will result in a large measure of employment, not only in mining, but also in manu facture of the innumerable products derivable from the shale.

QUEENSLAND

The geological maps prepared by the Queensland Geological Survey Department will suffice to show the great extent of mineral country, the variety of the minerals found, and the immense amount of work that remains to be done before mining takes its full place in the industries of the State. The proclaimed goldfields cover an area of 22,910,444 acres, and the proclaimed mineral fields 28,100,993, so that if the whole of the half-million odd people were to devote themselves to mining, there would still be room for plenty more, while the rich agricultural and pastoral lands would call for their millions. The position is that of a few people wrestling with a territory, which needs millions of arms and millions of pounds to develop it. When it is remembered that the minerals found in Queensland comprise anthracite, agates, antimony, asbestos, bismuth, coal, cobalt, copper, diamonds, gold, iron, lead, limestone, monazite, mercury, molybdenite, opals, rubies, silver, sapphires, tin, turquoise, topaz, wolfram, zinc, zircons, graphite, the significance of that statement, and the importance of the State from a mining point of view, need no further demonstration.

There is every indication that the development of the mineral resources has entered upon an era of active progress. The proposal is to extend the North-western railway from Richmond to Choncurry, which will give the vast copper deposits of that field a seaport at Townsville; and to authorize the Chillagoe Company to connect the Etheridge with their railway. This will make the growing town of Cairns the seaport of the Etheridge, and will pave the way for development, the magnitude of which can hardly be justly estimated at this stage. Queensland ranks third in the Australasian States as a gold producer, the relative positions being —West Australia, Victoria, Queensland. Up to the end of 1905 the total value of the gold won reached the splendid total of £62,022,130.

In mineral production the highest figures hitherto recorded were reached. Thus, the value of the total output for the State was £3,726,275, and that was due to the increased production of the industrial metals. Copper and tin contributed largely to that increase, and the prospects of the markets for both, and the practically inexhaustible deposits, justify the anticipation that they will bulk still more largely in the returns of coming years.



THE FAMOUS BENDIGO GOLDFIELD, VICTORIA

The actual return upon invested capital as represented by dividends declared last year amounted to £685,594. As a place for the working miner, Queensland may be said to occupy a very attractive position to-day. Sensational alluvial finds, such as happened in the earlier years of gold mining, and more recently in the Dee River area in Central Queensland, are rare, but over 1,200 European and over 500 Chinese diggers made a good living at alluvial mining, while over 8,000 were employed in quartz mining, and 6,946 were engaged in quest of other minerals. Every gold and mineral field has its band of men, who make a satisfactory living for themselves, working in freedom and independence, while miners employed on the various mines earn from 40s. to 70s., and, in some cases, 80s., a week for an eight-hours' day of work.

Gold.—As already indicated, the developments in gold-mining have been less noteworthy than in the industrial metals. This has been due not to diminished activity, but largely to the fact that the older goldfields, which in former years have helped so materially to swell the annual returns, have been marking time to some extent—that is to say, the energies of the mining companies have been largely devoted to development in the deeper levels; and prospecting in outside areas has not resulted in the addition of any as yet productive mines. Altogether, the value of the yield in 1905 was £2,517,295, which was a decrease on the figures of 1904 of £197,639.

Silver.—The greater portion of the 601,712 tons of silver produced last year (value, £69,176) came from the Chillagoe District, in North Queensland. Large bodies of silver-lead and copper ore are being opened up in the Mungana group of mines; and among other silver-lead mines whose ore will go to keep the Chillagoe smelters employed, are the Chillagoe Consols

Silver-Lead Mines, the Crooked Creek Mine, the Queen Mine at Orient Camp, the Mt. Emma Silver and Copper Mines, the Montalbion Mine, and the Muldiva Mines.

Tin.—North Queensland is the great tin-producing portion of the State. Except at Stanthorpe, the southern division has never had much to do with tin mining. The yield for the whole State last year amounted to 3,945 tons, and the value was £297,454. Those figures represented an increase in quantity of 22 tons, and in value of £27,178. Three dredges have been installed for the purpose of exploiting the creek beds and the alluvial flats of the district, and results have amply justified the enterprise. But really more than two-thirds of the total output for the year came from the Walsh and Imaroo Field, which embraces, perhaps, the richest tin area in the State—a region possessing a climate of wonderful mildness, and scenery of very picturesque characteristics.

Copper.—So far back as 1860 the output of copper was one ton, valued at £50. That single ton was, so to speak, the herald of a great day in copper mining, but it is only within the last few years that its accents have become generally audible. By a valiant effort, the production of the State was run up to 6,310 tons in 1869, but in 1898 it fell to 62 tons. Last year it bounded up to 7,220½ tons, of the very solid value of £503,547.

Wolfram, Molybdenite, and Bismuth.—The great proportion of the wolfram produced in Queensland comes from the Herberton and the Hodgkinson districts, where payable wolfram is being mined at Wolfram Camp, fourteen miles north-west from Dimbulah; the Neville mine, Koorboora, Bamford, four miles north from Petford; the Strathmore mine, near Boonmoo, Emuford, Butchers' Gully, six miles from Coolgarra; Mount Carbine, 22 miles north-west from Mount Molloy. Of these, the greatest mine is the Neville, where there is an extensive but irregular lode, originally worked by open cut, but now reached by shafts. Last year the product of this mine was ore valued at £18,800. Wolfram, molybdenite, and bismuth are so frequently found in association with one another that they are mined together; but at Wolfram Camp, the quantity of molybdenite is considerable enough to be mined independently. It is very friable, however, and great care has to be taken in extracting it from the gangue.

Manganese.—The production of manganese proceeds almost exclusively at the Mount Miller mine in the Gladstone district, and last year's output was 1,517 tons.

Iron.—Iron, coal, and limestone are provided in ideal positions for smelting; but the day of the manufacturer is not yet. The ore is here, and some day it will be a source of wealth beside which the gold mines of the State will sink into insignificance. Near Ipswich, and therefore close to Brisbane, in immediate proximity to coal measures and limestone beds, chrome iron is found in vast quantities.

Coal.—The State has really an embarrassment of riches in its wide-spreading coal measures. Take the nearest to Brisbane, the Ipswich coal field; that occupies an area of 12,000 square miles. Then there is the Burrum coal field, which extends from the mouth of the Kolan River to Norsa Head, and has been traced far up the valleys of the Mary and Burnett Rivers. Then, in the central district, a vast field seems to lie beneath the whole of the basin of the Fitzroy Creek. The measures in which pure anthracitic coal of exceptional value for steam purposes exists extend on the north from 21 degrees south latitude, 148 degrees east longitude, to 25 degrees south latitude, 150 degrees east longitude on the south. There is coal at Clermont, coal inland from Townsville, coal on the Palmer, coal at Cooktown, coal at Broadsound, coal under the north-western plains and downs, coal at Tambo, at Bungeworgorai Creek, at Winton, and in the Flinders River.

Monazite.—An interesting feature in connection with mining has been the discovery of monazite in the wolfram deposit of the Walsh and Imaroo mineral fields, a circumstance which has attracted the attention of both English and German mineral dealers. Most of this valuble mineral is found in the Mt. Garnet district, associated with wolfram. Recent assays of clean monazite sohw the mineral to contain about 3 per cent of thoria.

Gems.—There are many beautiful gems found in Queensland. The best known are, of course, opals and sapphires, of great variety and delicacy of coloring, and a few specimens of diamonds from time to time. The present position appears to be that the demand, or, rather, the prices obtainable are scarcely sufficient to give a great stimulus to this branch of mining. The Queensland opal is of exceedingly fine quality, and of great beauty. The value of last year's output was about £3,000, while that of sapphires, chiefly obtained from Anakie, was set down at £5,255.

VICTORIA

THE GOLD YIELD.

Victoria can claim to be one of the richest gold-bearing countries in the world. From the time of the first gold discoveries, in 1851, to 31st December, 1905, the amount of gold won amounted to 68,367,403 ozs. gross, valued at £273,236,500. The yield of gold for the year 1905 was 810,050 ozs. gross, or 747,166 ozs. fine, worth £3,173,744. There was a decrease of 10,967 ozs. as compared with 1904. Of the several goldfields districts, Bendigo was first with 212,465 ozs. Ballarat comes next with 145,331 ozs. Beechworth was a good third with 133,587 ozs. Castlemaine had 90,205, Maryborough 85,768, Gippsland 73,633, and Ararat and Stawell 23,651 ozs. respectively.

The official report of the Mines Department states that the largest increases in 1905, as compared with 1904, are those of Castlemaine and Beechworth districts, with 13,035 ozs. and 11,002 ozs. respectively, the improvement in each case being almost entirely due to dredge mining. In two other districts—viz., Gippsland and Maryborough—there were also increases—in the former of 6912 ozs., and in the latter of 619 ozs.—over the yields of the previous year. In the three remaining districts there were decreases. Bendigo showed a decline of 30,415 ozs.; Ballarat had 3642 ozs., and Ararat and Stawell 8930 ozs. less.

DIVIDENDS.

In respect to dividends in 1905, the official report of the Mines Department states that the total amount paid in dividends during the year was £454,431, which, although above the average of recent years, is a decline of £168,966 as compared with that of 1904.

The Bendigo goldfield was first on the list with £228,028, which was distributed by eighteen companies, whose paid-up capital amounts to £522,979. During the year the South New Moon Company returned £70,400 to its shareholders, and the New Moon Company £45,600.

The Beechworth district returned £70,313, of which the alluvial mines at Chiltern and Rutherglen provided £26,250, the Star of the West lode mine at Jamieson £11,875, and the dredging and sluicing companies at Beechworth and Buckland £31,388.

The Ballarat district yielded £66,700, towards which the Jubilee (quartz) at Scarsdale contributed £16,200, the Birthday Tunnel (quartz) at Berringa £9000, the William's Fancy (quartz), also at Berringa, £6000, and the Llanberris No. 1 (quartz), Ballarat, £6600.

The Castlemaine district provided £35,465, or £18,225 more than in 1904. Of this amount, the dredging companies at Castlemaine and Fryerstown paid £11,805; the Spring Gully (quartz) group of companies at Fryerstown, £11,002; the Victorian Cornish Gold Mines Co. Limited (quartz) at Daylesford, £6000; and the Eaglehawk Consolidated Gold Mining Co. (quartz) at Maldon, £6000.

In the Gippsland district £28,504 was paid by the Long Tunnel (quartz), Long Tunnel Extended (quartz), and Coronation (quartz) Companies at Walhalla, the Cassilis Company (quartz) at Omeo, and the Victory (quartz) at Foster. The Long Tunnel Extended distributed £13,440, bringing its aggregate up to £682,080 on a paid-up capital of £53,280.

In the Maryborough district the amount of dividends was £25,219 These were paid by the Lord Nelson Company (quartz) at St. Arnaud, Main Leads North Company (alluvial) at Maryborough, Newbridge United Co. (alluvial) at Newbridge, and the Great Columbian Co. (quartz) at Inglewood. The Lord Nelson Company paid £9000, bringing its total distribution up to £252,750 on a paid-up capital of £19,350.

In the Ararat and Stawell district only one small dividend was paid.

Some remarkable instances of the perfection to which mining methods and machinery have attained in winning gold from low-grade material are given in the report of the Mines Department. For instance, the Stewart's United Company at Fosterville, in the Bendigo district, obtained 474 ozs. of gold from 7104 tons of quartz, the average per ton being only 1⅓ dwt., equal to about 5s. 4d. per ton. The total value of the gold was £1896, which showed a small profit for the year over expenses. The Vaughan Dredging Company paid dividends, amounting to £800, on the treatment of 401,720 cubic yards of dirt, which yielded 810 ozs., or less than 1 grain of gold per cubic yard, the cost of winning the gold being less than 1½d. per cubic yard.

The Birthday Tunnel Co. at Berringa paid £9000 in dividends as the result of treating 28,450 tons for 6889 ozs., or an average of 4⅘ dwts. per ton.

DEEP MINES.

Some of the deepest mines in the world are to be found in Victoria, especially on the Bendigo field, where the quartz lodes have been followed down to an immense depth, and found to yield extremely rich stone. The mining inspector for the Bendigo district reported to the Mines Department at the end of 1905 that the New Chum Railway Company's mine was then 4175 feet in depth, and that it was intended to continue sinking until a depth of 4300 feet was reached. The Victoria Reef Quartz Mining Company's mine, also at Bendigo, is 4124 feet in depth, and there are a number of other mines on the field over 3000 feet deep.

DREDGING.

Great activity continues to be shown in dredge-mining. The total quantity of material treated during 1905 by bucket-dredging, pump-sluicing, and jet-elevating, according to the report of the Mines Department, was 13,450,945 cubic yards, as against 10,192,400 cubic yards in 1904. The gold obtained amounted to 72,953 ozs., as against 55,257 ozs. for the previous year, the average yield of gold per cubic yard treated being 2.6 grains, as against 2.37 grains in 1904. The quantity of stream tin won during 1905 was 94 tons 16 cwt. 1 qr., valued at £8428 7s.6d. The average quantity of material dealt with per week by each dredging plant was 4802 cubic yards, and the areas treated during the year aggregated 479.5 acres, the average yield of gold per acre being 152.1 ozs. The weekly yield of gold won by each plant averaged 26 ozs.

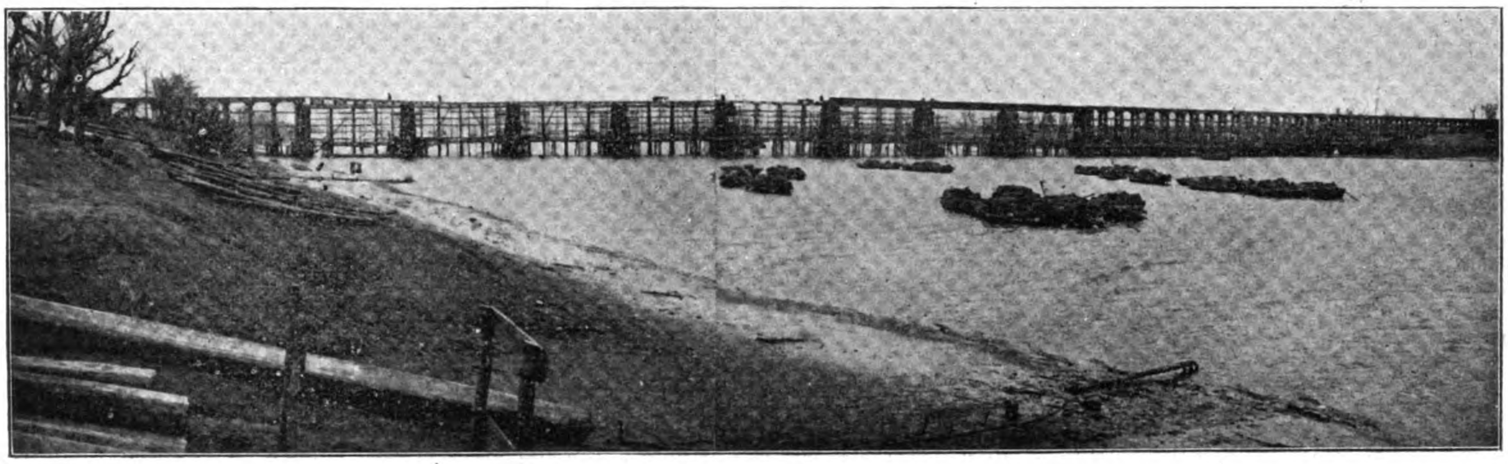
Altogether, 82 dredge-mining plants, comprising 26 bucket-dredges, 49 pump hydraulic sluices, 6 jet-elevators, and 2 rotary hydraulic plants, were in operation. The number of men employed in dredge-mining during the year was 2040, an increase of 540 over the number in 1904. The amount expended by the companies in wages, fuel, and maintenance for the year was £217,164, as against £104,000 in 1904. The sum paid in dividends during the year was £43,412. On 31st December, 1905, the number of new plants in course of construction was 38.

THE CYANIDE PROCESS.

From 1st January to 29th November, 1905, the report of the Mines Department says 626,745 tons of sand and tailings were treated by the cyanide process for a return of 45,221 ozs. 4 dwts. of gold, valued at £159,436. The cyanide process is covered by patent, and in 1900 the Government acquired the patent rights for £20,000, on condition that this money was repaid to the Government by the companies using it, in the shape of a royalty on the gold won. The total amount of gold won by cyanidation since the purchase of the patent rights in 1900 is 246,263 ozs., worth £829,266. The last instalment of the purchase money was repaid during the year, and the royalty now ceases. The sand

THE SEOUL-WIJU RAILWAY

The construction of the Seoul-Wiju Railway in Korea which connects Seoul and Wiju, a distance of 310 miles, during the war between Russia and Japan, was a remarkable achievement. It won for the chief engineer, Iwayo Ishikawa, the third order of the Korean Medal from the emperor for his remarkable services. The line was built in less than twelve months and was of the greatest possible value to the Japanese in solving the transportation problems of the war. At the present time the entire line is undergoing reconstruction, and when this is completed it will offer the most modern facilities for transportation through Korea into Manchuria. The line has been continuously in operation since its completion as a temporary road, and at the present time much of the road has been reconstructed and the new roadway is being utilized as the work progresses.



THE PO-YANG STEEL BRIDGE ACROSS THE DAIDO RIVER AT PING YANG TO ISLAND TO CONNECT WITH THE WOODEN BRIDGE—IT IS COMPRISED OF EIGHT SPANS OF STEEL GIRDERS AND IS THE MOST SUBSTANTIAL STRUCTURE ON THE SEOUL-WIJU RAILWAY

If one refers to a railway map of Korea, he will see that the Seoul-Wiju railway starts from Fusan in the extreme south of the peninsula, is joined by a short line from Massampo at a junction about 30 miles from its starting place, and then continues in a northeasterly direction towards Seoul, near which point it is joined by a branch from the principal port of Korea, Chemulpo. From Seoul a short line under construction branches off to Gensan. The main line continues mostly in a northeasterly direction to Ping Yang, where there is another branch being constructed to Chinampo. From Ping Yang the line then continues to the frontier town of Wiju on the Liao Yang.

The river has to be crossed by boat and on the other side, in Manchuria, the traveler finds himself on a narrow gauge line that is constructed as far as Mukden, a station of the Chinese Eastern Railway which connects at the Manchuria frontier town with the Trans-Siberian.

Of all these lines the two from Fusan to Seoul and from Chemulpo to Seoul were constructed by American capitalists and engineers before the war. It is, therefore, to the last portion, Seoul to Wiju, constructed during the war, that the writer makes particular reference. It must be borne in mind that every detail in the matter of supplies with the exception of the construction of the road bed had to be imported from Japan or the United States. This section is 310 miles in length and rises from 100 to 500 feet at various points. Three important rivers and several small ones are crossed. The wooden trestle is utilized throughout. As there were no cut stone available, the bridges had to be continued inshore for some distance, a false shore of sand bags in straw baskets being often employed to ensure stability at the jump off. The line is a single one with a siding at each station, together with yards at the more important ones. Although there is an abundant supply of water in the country, it occasionally happens that the sites selected for stations are devoid of actual water supply. Engines at many points have to take a run of a half-mile or so to get to the reservoir. All this is under revision, and the water will be ultimately connected with all the stations.

The standard gauge 4′ 8½″ having previously been initiated, it was adopted on all the other lines. This was necessitated in order to utilize the rolling stock available. It was equally necessary that in case of accident the enemy should not be able to utilize his rolling stock. This explains the construction, particularly of the narrow gauge portion of the line between Wiju and Mukden.

The Southern lines are equipped with 1st, 2nd and 3rd class cars and large, powerful 100-ton Baldwin locomotives. On the northern line there are only 2nd and 3rd class coaches and the engines are of the 50-ton tank class. As a rule they run about 20 miles an hour as their coal and water supply is limited. They then haul the return train back besides being utilized for hauling freight over that section. At present the trains are run in pairs. Thus an early morning train from Seoul to Ping Yang is followed by a second two hours later and two return trains start simultaneously from PingYang to Seoul. There are few local trains from various points, but these appear to be well patronized, the Korean taking kindly to railway traveling

MR. IWAYO ISHIKAWA

Engineer-in-Chief of the Seoul-Wiju Railroad—Decorated by the Emperor of Japan with the Third Order of Korean Medals.

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and tailings treated by the cyanide process are what were dumped and, in many cases, abandoned as worthless by the alluvial and quartz mining companies.

COAL MINING.

The production of coal during the year was 155,135 tons, valued at £79,035, or 10s 2d. per ton at the mines, which are all located in South Gippsland, around Korumburra, and Outtrim. The total output since the mines began work, twelve or fifteen years ago, to the end of 1905 was 2,514,135 tons, valued at £1,388,269.

OTHER METALS AND MINERALS.

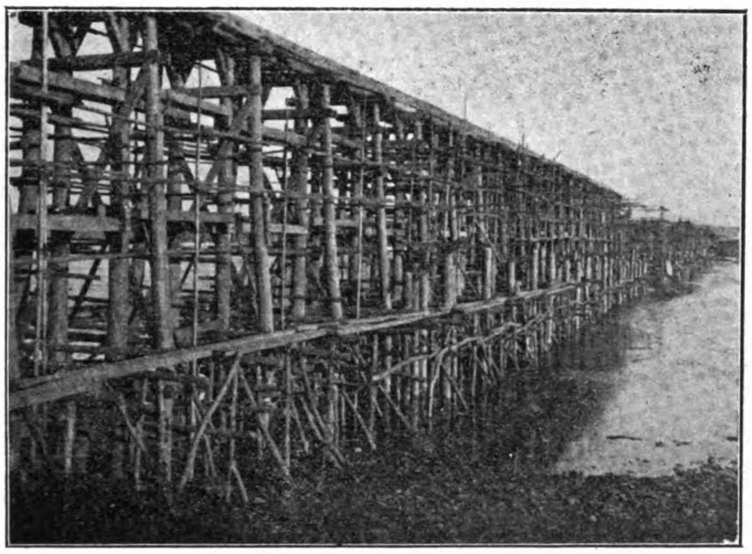
Besides gold and coal, small quantities of tin ore and antimony are produced. The chief sources of production of tin ore are at Beechworth, in the North-east, and Toora, in Gippsland. Antimony is obtained at Costerfield, near Heathcote. Copper ore is found in several localities a few years ago a deposit on the Thompson River, between Moe and Walhalla, in Gippsland, was worked. Deposits of iron ore at Dookie, in the Goulburn Valley, and in Eastern Gippsland (at Nowa Nowa), are extensive, but no attempt has been made to exploit them.

although not with the same eagerness as the Japanese, who in their native land are the most frenzied travelers in existence.

The trains go no farther than Ping Yang, 162 miles, in one day. The journey to Wiju is continued the next day and vice-versa. Each distance takes 10 hours.

rials for the new bridges and there are also some brickyards in operation where an exceedingly serviceable red brick is turned out.

The line follows the ancient road from Seoul and crosses it from time to time. The stations are very simple structures offering no more accommodation than the actual needs of the



ANOTHER VIEW OF THE WOODEN SECTION OF THE SEOUL-WIJU RAILROAD BRIDGE OVER DAIDO RIVER AT PING-YANG COMPLETED WITH 12-FOOT SPAN AND WOODEN BEAMS

CONSTRUCTION OF THE BRIDGE OVER THE DAIDO RIVER AT PING-YANG, KOREA, ON THE SEOUL-WIJU RAILWAY WITH A VIEW OF THE ICE FORMATION

situation. In all cases they are at some distance from the center of the Korean towns. Probably this is as much to enable the Japanese to construct a new town for themselves as to escape from the dirt and narrowness of the streets that are the characteristics of every native Korean city. Song To is more than a mile from the depot, Ping Yang about two and a half and Wiju almost four miles. The land in the vicinity of the stations can only be transferred by the natives to the Japanese under the regulations constituting these localities and known as "military zones."

As all the bridges are almost alike the one spanning the river at Ping Yang has been selected for illustration. It is built in two portions traversing between the two a large island. The wooden portion of the bridges has a 12 ft. span, and the steel box girders in the centers are 65 and 70 ft. span. This bridge was constructed during the winter. Much difficulty was experienced with the large masses of ice that collected and broke down the piles of the first scaffolding. The engineer was obliged to utilize some steel railroad material which could be placed at sufficient distance apart to enable the floating fragments to pass. This river and the one at Wiju are not very deep but the Riushin about 30 miles from Seoul is both deep and swift. The present line through the valleys where the adjacent hills are of some altitude present danger from washouts. The new line being constructed along the slopes of the hills culverts will probably be provided against this menace. It has only been necessary to tunnel about five or six times and none of these are of any considerable length.

The whole of this railway was surveyed and built within a twelve-month. It is due to one man alone. He is Ishikawa Iwayo. On the road's completion he was decorated with the third order of the Korean Medal. He had under his direction 30 assistant engineers, 80 railway constructors and 3,600 foremen gangers and laborers all experienced in railway construction. All these were Japanese. The Koreans employed numbered about 10,000 daily. Of these 167 persons were killed by accident, disease and otherwise during the years 1903-4-5-6. The total cost of the railway, inclusive of the sum paid to the Korean Government for the expropriation of the native landowners' rights, was 12 million yen (6 million dollars), and seven million yen for rolling stock. A further sum of 22 million yen was allotted for the reconstruction, calculated to spread over 4 years. All the steel girders, road metals and rolling stock are imported from the United States. The temporary road was constructed with 30 ft. rails weighing 60 lbs. and these are now being replaced with 33 ft. rails of 75 lbs. weight.

This undertaking is one of the most stupendous pieces of work yet accomplished by any nation. When one reflects upon the stress put upon the Japanese nation during the time this work was proceeding and the absolute barrenness of the country of any sort of detail for the work being carried on, words are lacking to give it the praise due without becoming fulsome.

As the railway was constructed at lightning speed it follows to a large extent the lay of the country. Where it was constructed through paddy fields, the necessary ballast was secured from shallow cuttings in nearby hills. The ballast was mostly comprised of sandstone and over this a surfacing of 18" of broken stone was imposed. In order to take the greatest advantage of the natural character of the country many curves were necessary and travelers frequently meet with 20 C, although 15, 12 and 10 are not unknown. In the same way the prevailing grades are 1 in 40, with a few 1 in 33. The steepest is from the 82nd milestone to the 97th, and engines are changed for this short stretch making it at over 30 miles an hour.

Now all this is being changed. The line is undergoing reconstruction. The new grades do not exceed in 100 and no curve is less than 40 C. Much has been already completed and the trains are running over the new track. It is expected to complete the work in about two years but considerable difficulty is being experienced at Chemulpo in effecting the landing of the girders of the bridge. Steamers have to anchor in the offing and the unloading from the lighters can only be accomplished at high water on an island connected with the town by a bridge as shown in the illustration. Several fine quarries have been established along the line for the purpose of furnishing the mate-

CONSULAR AND TRADE NOTES

The Austro-Hungarian consul at Rio de Janeiro calls attention to the demand that is likely to arise in Brazil for leather purses, in consequence of the substitution of metallic for paper currency.

Consul W. W. Canada, of Veracruz, Mexico, transmits a report on the rules and regulations governing the transit of merchandise on the isthmus of Tehuantepec, which is on file in the Bureau of Manufactures, where they can be inspected by persons interested.

For the protection of growers of sugar cane the Venezuelan Government decreed, as Consul James W. Johnson reports, that alcohol produced in the country and denaturalized for use in lamps, heating apparatus, and alcohol motors, be exempted from taxation for two years beginning with January 1, 1907.

Consul A. A. Winslow, of Valparaiso, reports that the imports into Chile from Germany during the first nine months of 1906 amounted to $12,197,128, an increase of $4,471,083 over the corresponding period of 1905. The consul says Germans have the advantage of cheap freights and direct lines of steamships.

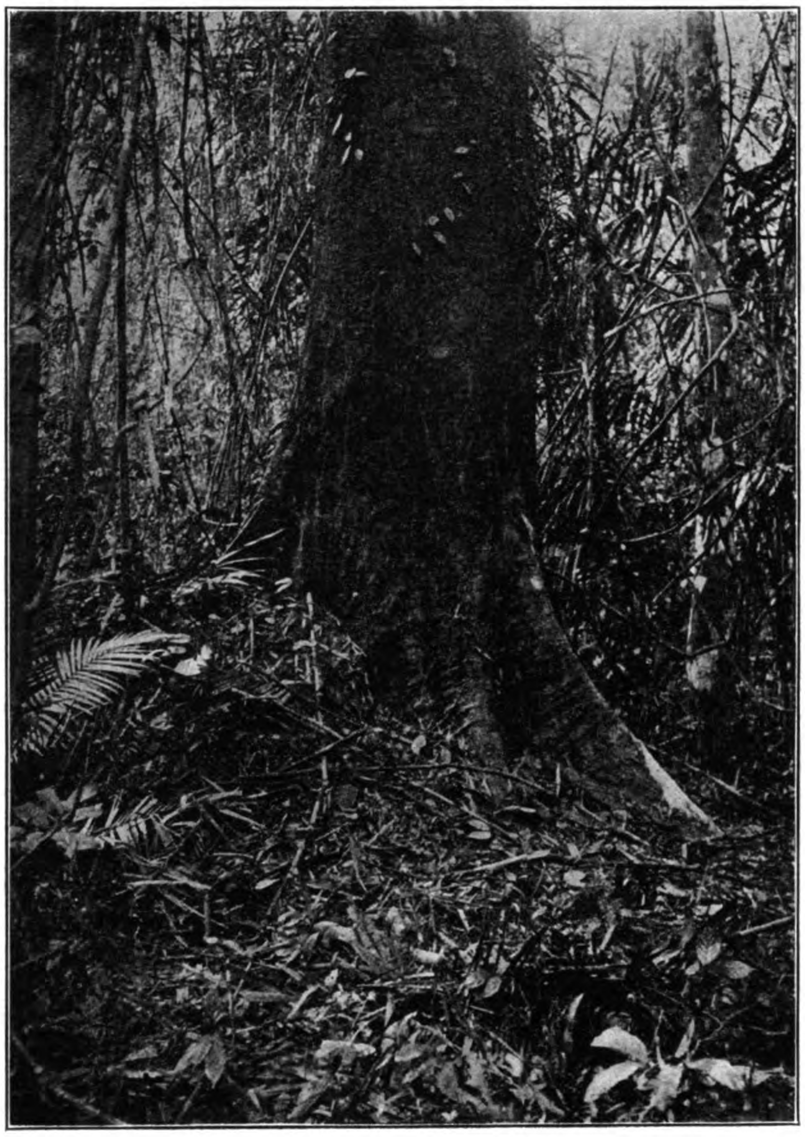
Consul-General W. H. Michael, of Calcutta, reports that over 800 natives of British India, who had gone to Trinidad to work temporarily, returned on December 31, 1906, with about $66,666 in cash. One family brought back $3,000. Most of these people will, in all probability, invest their savings in land.

The British consul-general at Warsaw reports that while the Polish cotton trade is good the cost of production, on account of labor and other troubles, has become so high that the Polish cotton manufacturers are losing ground in the Far East and in the remoter parts of Siberia, where a good portion of the trade is falling into British hands.

Northeastern India is growing Abasi-Egyptian cotton. A public sale of this staple was held at Karachi on January 5 under government supervision, according to the *Indian Trade Journal*, and about 125,000 pounds disposed of. The Journal adds that the whole scheme of auctions of cotton grown from Egyptian seed has been successful and the growers greatly benefited.

SUCCESSFUL OPERATIONS OF THE MINDORO LUMBER AND LOGGING CO.

The prospect for the development of the lumbering industry in the Philippines grows brighter as the years pass and many hundreds of thousands of American dollars have already been invested successfully, as the reports of the different companies demonstrate. Among those pioneers that have blazed the trail in the Philippines and are prospering beyond expectations, is the Mindoro Lumber and Logging Company of Bongabon, Mindoro, P. I.



APITONG; DIAMETER, 126 CENTIMETERS

This company has secured a concession under the terms of a license agreement for a tract of land covering an area of about 85 square miles upon the east coast of the island described in the terms of the license agreement with boundaries as follows:

"From the Sucol River south to the Uasig River, and 10 miles inland." Upon ascending the Sucol River it was found that the native name is changed to Inuman after a short distance, therefore this river has been taken as the north boundary. A short distance inland the Uasig River divides into two branches, a large one known as the Baroc, and a small, nearly dry stream called the Uasig.

The highest altitude of the tract is about 100 feet sloping gradually to sea level and the country is drained by the Bongabon, Dangay and Uasig rivers, all of which may be utilized to float logs to their mouths. The Bongabon is the largest of the three flowing through a grassy flood plain half a mile wide.

Major George P. Ahern, director of forestry, has issued a pamphlet giving a complete review of a preliminary working plan for the public forest tract of the Mindoro Lumber and Logging Co. prepared by Melvin L. Merrit, forester in charge of district No. 4 and H. N. Whitford, Ph. D., forester and chief of the division of forest products. This circular devotes much space to a description of the tract and its natural advantages as a center for profitable lumbering. It also includes a report of the year's work ending June 30, 1906, showing the profit made by employing only the most primitive methods and the remarkable prospect in that region for the company equipped with the most modern machinery. The Bongabon Lumber and Logging Company proposes to keep pace with the times and the most modern equipment will be installed as the company extends its operations. The following excerpt from the circular referred to is a concise statement of the operations, including the transportation and the marketing of the product by this company during the period referred to, with a financial statement showing the net profits:

"The license agreement of the Mindoro Lumber and Logging Company is dated June 3, 1905. Table XXI, computed from data taken from the company's books, shows the amount of timber that has been marketed from that time to July 1, 1906.

TABLE XXI.—*Timber sold by the Mindoro Lumber and Logging Company during the year ended June 30, 1906.*

Name.	In the log (round). English cubic feet.	Cubic meters.
Guijo	20,284.04	574.35
Narra	8 648.67	244 89
Lauan	5,822.66	164 83
Apitong	2,612.65	73.97
Amuguis	1,279.79	36.24
Candol-candol	651.37	18 45
Palo Maria	429.48	12.16
Pagsahingin	176.70	5
Pahutan	189 19	5 36
Pili	44 59	1 26
Malugay	52.54	1.49
Ipil	40 20	1.14
Others	328.68	9.31
Total	40,560.56	1,148.50

Timber sawn on tract by company's sawmill.

	Feet B. M.
Lauan	24,219
Amuguis	10,535
Apitong	5,611
Guijo	5,503
Narra	2,112
Total	47,980

In addition to this, a small amount of timber is still at the mill which, with the amount that has been used for construction purposes on the tract, is approximately equal to the quantity of sawn timber sold.

Previous to July 3, 1905, a number of individuals or companies have from time to time held this tract, or portions of it, together with some adjacent forest. In no case did these concessions coincide with the present one, hence it is impossible to state the exact amount removed from it. It is believed, however, that only a small amount of timber had been cut from the forest south of the Bongabon River. North of the Bongabon River a larger number of logs have been taken from the scattered timber lands near the Tidiangan and Sucol Rivers. It is stated by the natives that in former times a great many logs had been sold from the barrio of Paclasan from territory now occupied by Calaanan and grass.

PRESENT LUMBERING OPERATIONS.

A very primitive method of logging, similar to that employed by native lumbermen, has been used by the present company. The trees are felled and chopped by Filipino laborers into lengths 3 to 6 meters (10 to 20 feet) long. For this work American axes are used, although occasionally saws are substituted. The logs are then loaded upon rude sleds similar to the logging "dray" of the United States, and dragged by a team of from six to eight carabaos to the mill or to some point along the tramway which leads to the beach. The rough trails over which this hauling was done are made by merely cutting away the underbrush. These roads are passable, except at the lowest places, at almost any season of the year. At the tramway the logs are loaded upon small cars drawn by one or two carabaos and hauled one at a time to the beach.

HAGACHAC: DIAMETER, 107 CENTIMETERS

The cost of such operations as this can only be given approximately. Ordinary wages and costs are about as follows:

Manager	per month	₱150 00
Head foreman	do	40 00- 60 00
Gang foreman	per day	1 00
Choppers	do	75- 1 00
Other laborers	do	.50- 75
Carabao, with driver	do	1 50- 1 75
Carabao, value	each	100 00-150 00

₱2=$1 U. S. currency.

Two men can fell and cut into logs from two to four medium-sized trees per day, or from 300 to 500 English cubic feet. A team of six to eight carabaos, with a driver for each animal, will haul from three to six logs per day for an average distance of half a mile. Two carabaos and their drivers will haul about four logs per day on the tram car from the mill to the beach, a distance of 1½ miles.

Working upon this rude basis, the cost of cutting and delivering at the beach by the present method will vary from ₱0.07 to ₱0.13 per English cubic foot, depending greatly upon the length of haul, management, and kind of timber cut, Counting an English cubic foot equivalent to 7.2 feet B. M.,[1] this would be a cost of from ₱9.75 to ₱18 per 1,000 board feet. Contracts are sometimes made to cut and deliver logs to the beach when the average distance is one-half mile, at the rate of ₱2 per average log of 40 or 50 cubic feet, the contractor being supplied with carabaos by the owner. This would mean about ₱6 per B. M., in addition to the rental of the carabaos. In other cases, the contractor supplies his own carabaos and received from ₱0.08 to ₱0.10 per English cubic foot, or about ₱12 per M feet B. M. for logs delivered on the beach.

The present cost of logging could be greatly reduced by more careful organization and by providing cheaper methods of transporting the logs from the forest to the beach, which is by far the largest single item of expense. To do this, it is suggested that iron rails be used upon the tramway, instead of wooden one. This would permit the hauling of several logs instead of one at a time, would avoid breakage of rails and cars, and would greatly reduce the draft, thus permitting more trips per day. It is also suggested that wide-tired, two-wheeled logging carts be tried instead of the logging sled. These have a lighter draft, and, where tried in other parts of the Islands, have given excellent satisfaction. A steam logging and skidding outfit, including two donkey engines and 2 miles of cable, could be used upon the tract and would greatly reduce the cost of logging.

A portable sawmill, having a capacity of about 10,000 feet B. M. per day, has been placed upon the tract. Owing to difficulties incident to the installation of this mill, it has not yet been operated sufficiently to allow any estimate of the cost of running.

[1]Measurements made by the Gibson's Saw and Planing Mills Company upon a few Narra logs that were sawn with a band saw showed the following facts: Forty-three logs, containing 41.81 cubic meters (1,476.58 English cubic feet), yielded 15,199 feet B. M of lumber not edged. Allowing for a waste in edging of 20 per cent, this would be a yield of 290.81 feet B. M. per cubic meter, or 8.24 feet B. M. per cubic foot. The above factor of 7.2 feet B. M. per cubic foot therefore is conservative.

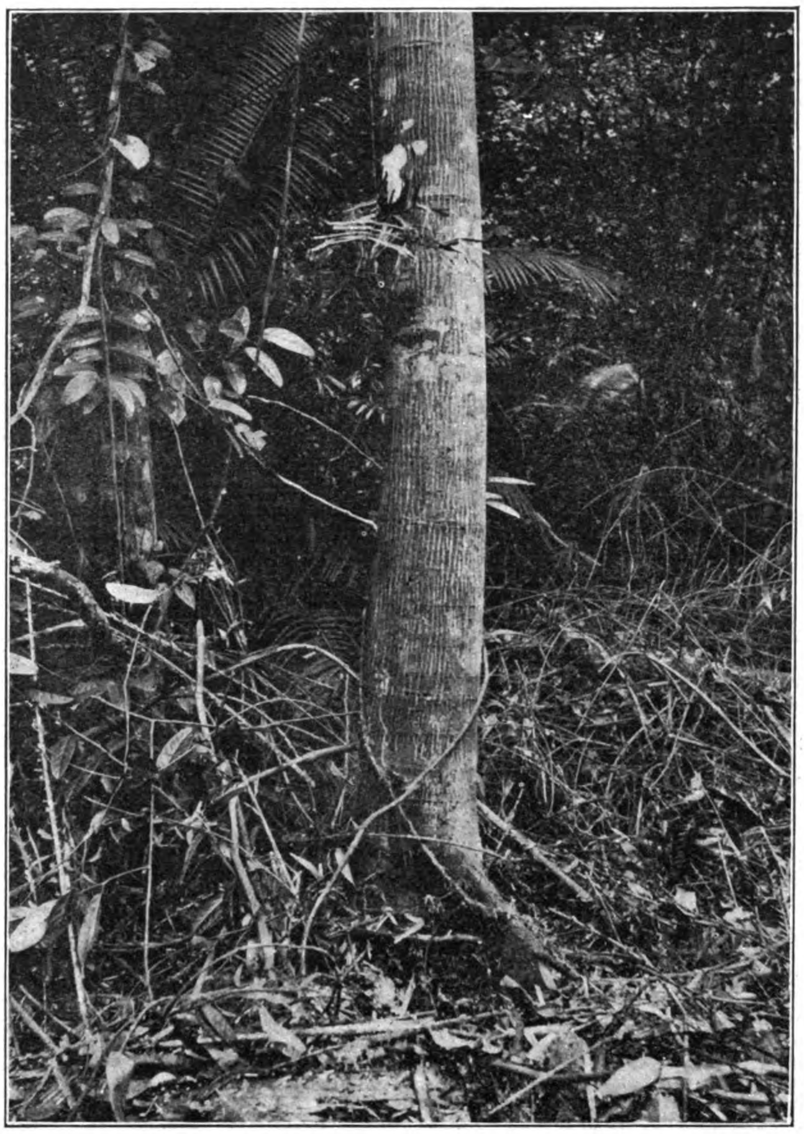
In addition to the regular logging operations, the present company has cut a number of table tops from the large flat buttresses of Narra trees. These can be removed with saws and axes and can be secured up to 6 feet in diameter. Usually the buttresses vary from 4 to 12 inches in thickness, and may be hewed to an even thickness of about 3 inches. One of these tops, which measured 5 feet in diameter and 3 inches in thickness, was removed under the direction of the field party at a cost of a little less than ₱18.00. In this case, the men were hired for this work alone. With a regular organized force, the cost should be reduced about one-half.

MARKETS AND TRANSPORTATION.

Practically all of the logs and lumber is sent to Manila by means of steamers or sailboats. The cost of shipment from the tract to Manila (distance 200 miles) varies from ₱0.18 to ₱0.25 per English cubic foot, which would be, counting an English cubic foot equal to 7.2 feet B. M., ₱25 to ₱34.72 per M. feet B. M. The cost of transportation is slightly less upon sailing vessels than upon steamers. The logs are floated to the ships, which, on account of the shallow water, are required to anchor nearly one-quarter of a mile from shore. The regular charge for this is ₱0.50 per log, which amounts to about ₱0.01 per English cubic foot, or ₱1.39 per M feet B. M. Weather conditions are an important factor to be considered in connection with transportation. Sometimes storms delay loading, hinder transit, or affect the shipper very seriously in a number of ways.

The following are the average prices now paid in Manila for logs and for sawn timber:

Name.	Per English cubic foot in the log.	Per Spanish cubic foot in the log.	Per M feet B. M. sawn timber.	Stumpage charges per M. feet B. M. United States currency.
Yellow Nara	₱0.92-₱1.05	₱0 70-₱0.80	₱225-₱275	$5 00
Hagachac...	.46- .48	.35- .37	90- 115	1 00
Lauan.......	.39- .46	.30- .35	70- 90	1 00
Amuguis....	.52- .98	.40- .75	110- 150	2 00
Guijo........	.65- .85	.50- .65	98- 140	3 00
Apitong.....	.36- .48	.35- .37	90- 115	2.00
Sacat........	.52- .98	.40- .75	100- 150	2 00



A YOUNG TREE OF LAUAN; DIAMETER, 30 CENTIMETERS

FINANCIAL RESULTS AND PROSPECTS.

Summarized, the cost, exclusive of taxes or stumpage charges of logging and delivery in Manila, should not exceed the following:

	Per English cubic foot.
Cutting and delivering on the beach..	₱0.07 to ₱0.18
Loading upon shipboard..............	.01 to .01
Shipping to Manila.....................	.18 to .25
Wage of officials, breakage, etc.......	.02 to .02
Total........................	.28 to .41

This cost, as with the calculations throughout, is estimated regardless of the groups to which the logs belong. As a matter of fact, it costs slightly more to remove Narra than other kinds of timber, for the trees are lower growing and the logs harder to handle on account of their angular shape. With the other kinds of timber there is but little difference in the cost of handling.

Taking into account the stumpage charges, the cost of delivery, and the selling prices, it will be seen that there is an excellent profit to be made upon the higher-group timbers, and a fair one upon all, even with the primitive methods in use. With improved methods and equipment, the cost should be so reduced that an assured profit could be made upon all timber taken from the forest.

STRAITS RUBBER COMPANIES

A report, by Mr. G. M. Dundas Mouat, on the Bertam Estate, Province Wellesley, Straits Settlements, has been issued to the shareholders of the Straits Settlements (Bertam) Rubber Company, Limited. He found work progressing most satisfactorily and a wonderful improvement all round, that in the appearance of the rubber being most apparent, whilst the drains have been thoroughly attended to with marked effect. He speaks most hopefully of the rubber prospects. He concludes:—We are fortunate in our manager. With the Malakoff Estate, on our boundary, relations are of the most cordial nature, and the estates are thereby enabled to work together—a most desirable condition when it is remembered how Bertam and Malakoff form practically the whole of the Northern Province. Government, too, is so far trying to meet us whenever and wherever possible, and from all points of view our prospects are extremely bright. I have much pleasure in congratulating you on the acquisition of such a large property with such excellent prospects.

ANGLO-JAVA SYNDICATE

The Anglo-Java Syndicate has been registered at Home with a capital of £10,000 in £5 shares. To adopt an agreement with G. R. Edgecombe to acquire concessions for india-rubber estates, &c. No initial public issue. First directors (not less than three nor more than five) to be appointed by signatories.

SEAFIELD RUBBER CO.

A London wire of Feb. 23 says:—The Seafield (Selangor) Rubber Co., Ltd.'s, issue has been four times subscribed, and the shares command 1s. 4d. premium.

NEW CEYLON COMPANIES

The Udabage Co. being formed in Colombo has been well subscribed for at home.

The P. P. K. Rubber Estates, Ltd., has been registered at Home. The Company is acquiring Putupaula estate, and its capital is £65,000.

ULU RANTHU RUBBER ESTATE

The statutory meeting of the Ulu Ranthu Rubber Estate Company, Ltd., was held at the registered offices, 81, Gracechurch street London, E. C., on Feb. 5th. The directors present were Mr. E. S. Grigson (in the chair) and Mr. P. C. Oswald. In moving the adoption of the report, the Chairman made the following remarks: No prospectus having been issued in connection with the formation of this Company, the following particulars may be interesting to the shareholders:—The property consists of a block of land 1,009 acres in extent, and is held on perpetual lease from the Government of the Federated Malay States at an annual quit rent of $1 per acre. It is situated in the Negri Sembilan district, close to the well-known Seremban Estate, and immediately adjoining properties belonging to the Anglo-Malay Company. It is most conveniently placed for transport purposes, there being a Government cart road at the foot of the land, leading to two railway stations, one on either side, and both are within a few miles of the property. The soil is of the average hill country type, and the land being all undulating and hilly, there is a good natural drainage. The acreage is as follows:—124a, 1r. 30p. opened in 1904, 102a. 1or. 30p. opened in 1905, 111a. 1r. 3p. opened in 1905-6, 177a, 2r. 4p. opened in 1906; total opened, 515a. 1r. 27p.; reserve land, 494a.; total, 1009a. 1r. 27p. The growth of the rubber trees has been most favorably reported on, and while there are still some failures to renew in the later opened land, the work in connection with the several clearings has been well and carefully done. It is the wish of the directors to proceed with the further development of the property, and it is expected that another 100 acres will be opened during the year 1907, but they attach great importance to keeping the already planted area in good order as regards weeding and draining, etc., and further extensions, therefore, will depend a good deal on the amount of labor that may be available. Just at present the supply of Tamil coolies is not very abundant, the scarcity being partly due to the demand for labor that has arisen in the neighborhood and partly to the effects of a very unhealthy season. To meet the requirements of routine work, Chinese labor has lately been employed on the planted area, and though it is satisfactory to know that this labor is available in case of need, Tamil labor is cheaper and better for estate purposes, and the manager hopes soon to have a sufficient supply of the latter for his requirements. The purchase price of the estate, which was paid entirely in shares, amounted to £14,375. Assuming the reserve land to be worth £5 per acre, the cultivated area works out at an all-round average price of £23 per acre for 515 acres of rubber, some of which is now upward of two years old. The figures will be found to compare very favorably with those pertaining to other companies in the Federated Malay States.—*Straits Chronicle.*

SINGAPORE AND JOHORE RUBBER CO., LTD

The third report of the directors to the shareholders at the meeting on March 26th reads:—

Your Directors beg to submit the Accounts for the year ended 31st December last. It will be seen that a further sum of $51,644.62 has been expended on Development making the total to date $89,241.54.

LABOR.—The difficulty of securing a sufficiency of Coolies has at last been surmounted. A force of 443 Tamils has been successfully recruited from India, and Javanese Coolies are now coming in freely. The want of sufficient labor has heretofore considerably delayed the opening up of the Estate but your Directors are now in a position to push ahead with development and, as will be seen from the Manager's Report, they expect to have over 1,200 acres under rubber by the end of 1907.

GAMBIER.—Although the Estate is producing an absolutely pure article it has been difficult to get buyers to take an interest in the product, and further planting has been stopped for the present. Samples have been freely distributed and enquiries which have emanated therefrom lead your Directors to hope that ultimately a market will be found.

BUILDINGS.—During the year further lines have been erected and there is now sufficient accommodation of this sort for all the Coolies likely to be required on the Estate. A Bungalow, Office, Shop, and Hospital have also been erected.

DIRECTORS.—The board now consists of Messrs. A. W. Stiven, F. W. Barker, D. T. Boyd, and W. D. Fisher. In accordance with the Articles of Association Mr. F. W. Barker retires and as he is leaving for Europe shortly does not offer himself for re-election.

THE SANDYCROFT RUBBER COMPANY, LIMITED

The following is the second report of the Directors to the Shareholders:

Singapore, March 18, 1907.

Gentlemen,—Your Directors beg to submit a duly audited statement of accounts for the year ended 31st January last. The net profit for the year after making ample provision for depreciation amounts to $17,679.81 to which has to be added the balance of $1,285.88 brought forward from last account, making a total of $18,965.69 available at 31st January 1907.

Your Directors recommend:—(1) That a dividend of 20% be paid to shareholders absorbing $17,000. (2) That $500 be transferred to Employees' Bonus Account. (3) That the balance of $1,465.69 be carried forward to next account.

CULTIVATION.—The area under rubber is now 257 acres with some cocoanuts intermixed and there are 6 acres under cocoanuts only. The rest of the land, say some 10 acres, is either occupied by buildings or is low-lying and swampy and may be left out of account.

PARA RUBBER.—13,046 trees were tapped during the year resulting in a yield of 12,717 lbs. Sheet, and 3,461 lbs. Scrap, which as you will see from the accounts is estimated to give to give a net return of $27,128.88.

The rubber in transit and in store has been taken at $1.75 per lb. for Sheet, and $1 per lb. for Scrap which your Directors consider quite safe prices.

14,120 trees have been marked for tapping during 1907.

Seeds and Stumps have met with a ready sale, and an income of $4,159.04 has been received from this source.

LABOR.—The force on the Estate is not sufficient for present requirements but steps are being taken to remedy this.

BUILDINGS.—The rubber store has been considerably extended. Some small expense will be incurred during the current year in moving certain of the Coolie Lines to what is expected will prove a more healthy situation, and some addition to the Lines will have to be made, but no large expenditure under this head will be necessary in the immediate future.

EXTENSION.—Negotiations have been completed to purchase from Mr. Bratt about 150 acres of land adjoining Sandycroft Estate in exchange for 50 fully paid shares in the Company. The land is all planted up with yearling stumps and was taken over by the Company on 1st February last. Your Directors consider that the acquisition of this land considerably enhances the value of your property. To obtain the necessary Capital to carry these 150 acres into bearing your Directors decided to issue the remaining 100 shares of the Company at a premium of $150 per share and to offer these in the first instance to present shareholders.

DIRECTORS.—The Board now consists of Messrs. F. W. Barker (Chairman), E. H. Bratt, M. E. Plumpton, and A. W. Stiven. In accordance with the Articles of Association Mr. Stiven retires, and as he is leaving the Colony, does not offer himself for re-election.

AUDITORS.—Messrs. Derrick & Co. retire and offer themselves for re-election.

F. W. BARKER, *Chairman.*

ELECTRIC LIGHT PLANT FOR SALE

In another column may be found the advertisement of the Manila Electric Lighting and Power Co., offering for sale an entire electric light and power plant with every modern equipment. The plant was formerly the property of the Electricista and furnished the light and power for the city of Manila previous to the granting of the franchise to the new company. This is a splendid opportunity to secure an up-to-date plant at a most reasonable price.

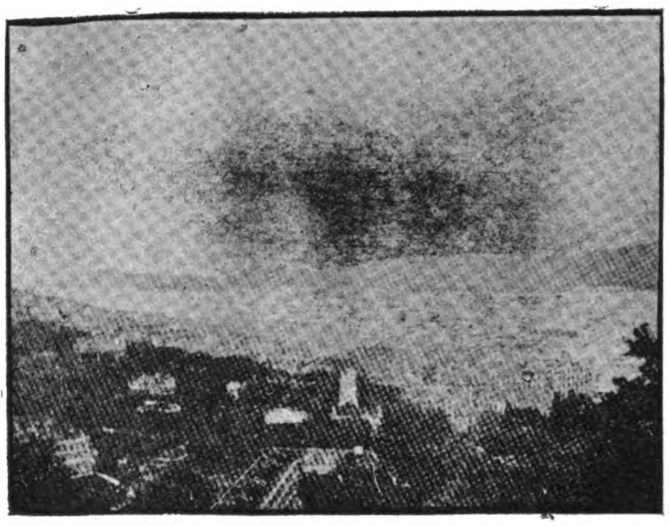
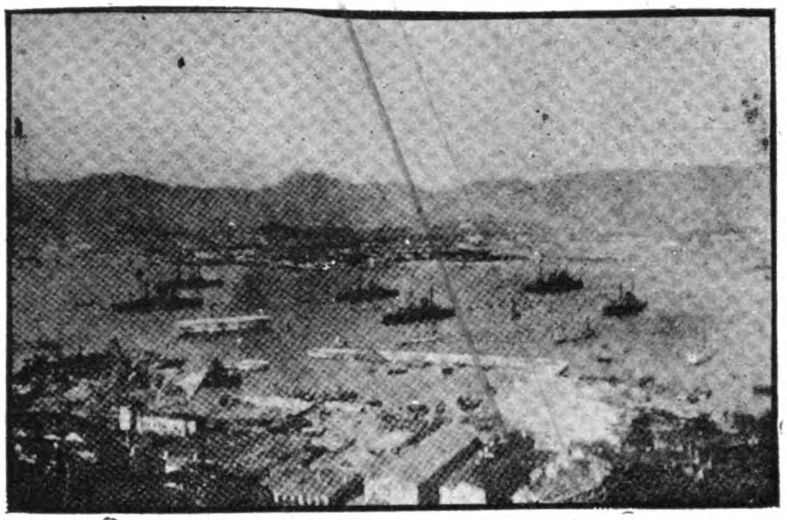
HONGKONG HIGH-LEVEL TRAMWAYS CO.

The following is the liquidators' report of the Hongkong High-Level Tramways Co., Ltd., submitted at the meeting April 3:

"In accordance with the agreement made for the sale of the undertaking of the Hongkong High-Level Tramways Company, Limited (the old company), to the Peak Tramways Company, Limited (the new company), the liquidators have to distribute among the shareholders of the old company the profits earned by the old company since the 30th November, 1904, up to the 18th October, 1905, and also the sum of $2,796.28 at credit of profit and loss account of the old company on 30th November, 1904. A first dividend in liquidation of $20 per share was paid on 3rd September, 1906, and we now declare a final dividend of $11.15. Subject to the above the whole of the assets and liabilities of the old company will be handed over to the new company after the consent of the Government has been obtained to the transfer. The accounts of the old company are now closed.

HONGKONG'S SHIPPING FOR 1906

The report of the harbormaster of the port of Hongkong for the fiscal year ending December 31, 1906, has been submitted to the Legislative Council of Hongkong and shows a marked increase in the tonnage of that port compared with former years. The following excerpt is taken from the Hongkong *Government Gazette:*

HONGKONG HARBOR FROM THE PEAK SHOWING NEW NAVAL DOCKS

SHIPPING.

The total tonnage entering and clearing at ports of the Colony during the year 1906 amounted to 32,747,268 tons, being a decrease compared with 1905, of 1,437,823 tons; but in combining ocean and steam-river trade, a tonnage amounting to 19,793,384 is shown, an increase of 86,656 tons over 1905 and the highest yet recorded. In putting aside river trade, a substantial increase in ocean trade appears, amounting to 789,857 tons.

There were 214,556 arrivals of 16,394,508 tons, and 215,170 departures of 16,352,760 tons.

Of British ocean-going vessels 3,595,879 tons entered, and 3,593,592 tons cleared.

Of foreign ocean-going vessels 3,565,449 tons entered, and 3,528,046 tons cleared.

Of British river steamers 2,424,961 tons entered, and 1,311,439 tons cleared.

Of foreign river steamers, 334,831 tons entered, and 333,086 tons cleared.

Of steamships under 60 tons trading to ports outside the waters of the Colony 20,141 tons entered, and 20,141 tons cleared. These figures do not include private steam-launches.

Of junks in foreign trade 1,307,972 tons entered, and 1,311,493 tons cleared.

Of steamships under 60 tons plying within the waters of the Colony 4,125,768 tons entered, and 4,125,768 tons cleared. These figures are incomplete, as the "Star" Ferry Company's craft are not included, the Company stating that no record is kept of the number of trips made, or passengers carried, by their vessels.

Of junks in local trade 1,019,507 tons entered, and 1,023,148 tons cleared.

Seven thousand seven hundred and seventy-two (7,772) steamers, 14 sailing vessels, and 439 steamships under 60 tons in foreign trade, entered during the year, giving a daily average entry of 22.5 as compared with 24.81 in 1905. If the figures for foreign trade junks are added, the daily average would be 61.4, as against 70.5 in 1905.

For ocean vessels under the British flag, the table shows a decrease of 298 ships of 482,853 tons. This decrease is mainly due to vessels under the Japanese flag returning to their various routes at the conclusion of the late war, thereby supplanting several British vessels which had been chartered in their stead, and partly to the disappearance of tramp steamers which carried stores for the opposing fleets; and eliminating the 893,890 tons ascribed in last year's return as an abnormal increase, practically due to the state of war existing, a legitimate increase to the British flag is shown, amounting to 411,037 tons.

In British river steamers there is a decrease of 1,024 ships of 711,521 tons shown, which is due to the serious disasters that befell these steamers during the typhoon on the memorable 18th of September, and to the gutting by fire of the Hankow in the following month. During the necessary repairs of the crippled vessels, coasting steamers of small size were utilized in some instances by the different companies.

For foreign ocean vessels an increase of 442 ships of 1,272,710 tons is shown, which is almost wholly due to the Japanese vessels taking up their respective routes in place of the British vessels temporarily chartered, amounting to 594 ships of 1,275,640 tons in 1906, against 58 ships of 69,146 tons in 1905, an increase of 536 ships of 1,206,494 tons. Additionally, Corean steamers for the first time since 1901 entered the port, and assisted in the increase by 30 ships of 61,596 tons. Vessels under Norwegian flag show a decrease of 135 ships of 186,093 tons.

For foreign river steamers an increase of 96 ships, representing 8,320 tons, is shown and can be ascribed to more trips being made by vessels under the French and Portuguese flags, supplemented by vessels under the German and Japanese flags which did not compete in this trade before.

The other increases and decreases are of small importance, excepting junk and steam-launch trade within and outside the waters of the Colony. These vessels in many cases suffered disastrously in the typhoon already mentioned, and can be applied to the abnormal decrease shown, assisted by a gradual falling off in junk trade throughout the year.

The actual number of ships of European construction (exclusive of river steamers and steam launches) entering during the year was 870, being 417 British and 453 foreign.

These 870 ships entered 4,012 times and gave a total tonnage of 7,151,328 tons. Thus, compared with 1905, 19 less ships entered 86 more times, and gave an aggregate tonnage increased by 404,728 tons.

The 417 British vessels carried 3,604 British officers and 31 foreign officers as follows:—British, 3,604; Danish, 2; Dutch, 2; Norwegian, 2; United States, 25—total, 3,635. Thus, the proportion of foreign officers serving in British vessels was 0.85 per cent., comprising four nationalities. A decrease of 0.14 per cent., with a decrease in number of officers and ships.

The 453 foreign vessels carried 3,377 officers, of whom 170 were British as follows:—Chinese vessels, 84; French vessels, 2; German vessels, 2; Japanese vessels, 47; Russian vessels, 3, United States vessels, 32—total 170. Thus; 5.03 per cent. of the officers serving in foreign vessels visiting the port were of British nationality. An increase of 0.92 per cent. with an increase in number of ships and of officers therein.

The 417 British vessels carried, as crews, 30,694 British, 1,837 other Europeans, and 108,032 Asiatics; while the 453 foreign vessels carried 1,594 British, 37,166 other Europeans, and 97,018 Asiatics. Hence, in British vessels: —21.7 per cent. of the crews were British; 1.3 per cent. of the crews were other Europeans; 77.0 per cent. of the crews were Asiatics. And in foreign vessels:—1.2 per cent. of the crews were British; 27.4 per cent. of the crews were other Europeans; 71.4 per cent. of the crews were Asiatics.

TRADE.

Only an approximation of detailed cargo measurement, weight, etc., is given under this heading, in many cases, enumerated cargo, which should be so shown (as expressed in table under imports) is reported as general, except sugar and opium, these being manifested at this office can be taken as reliable.

Under imports there appears an increase of 159,426 tons, or 4.1 per cent., principally due to sugar, general, rice and flour, respectively. In sugar 170,391 tons or 54.6 per cent., is shown.

In rice, 58,198 tons, or 10.3 per cent., is recorded. This increase would have been considerably enhanced were it not for the scarcity of cargo boats, following the typhoon in September. Many of the vessels departed with full cargoes as transit, which otherwise would have been reported as imports.

In flour, 25,127 tons, which points somewhat to a cessation of the boycott of this commodity from the United States, although some small shipments have been reported from Australia at the early part of the year.

Among the decreases, coal is prominent, amounting to 112,622 tons, which may be explained to some extent in the same manner as reported in 1905, a cessation of maritime warfare and an overstocked market.

Case oil follows with a further falling off of 45,569 tons, this reduction may be ascribed to the large stock accumulated in the Colony on account of the boycott and to shipments that passed through the harbor as transit for other ports, which hitherto, in some instances, were landed and reshipped at this port.

A decrease is reported of 537,058 tons in transit cargo, which may be explained by the falling off of transport service at the conclusion of the late war and to a reported general slackness of trade existing for some time past.

The report also shows a decrease of 232,864 tons in export cargo.

The total reported import trade of the port for 1906 amounted to 22,408 vessels of 11,249,233 tons carrying 7,372,075 tons of cargo of which 4,493,715 tons were discharged at Hongkong.

Similarly, the export trade of the port was represented by 22,142 vessels of 11,203,844 tons, carrying 2,778,441 tons of cargo and shipping 690,689 tons of bunker coal.

During the year 1906, 15,519 vessels of European construction of 19,793,354 tons (net register), reported having carried 9,759,648 tons of cargo, as follows:—Import cargo, 4,029,177 tons; export cargo, 2,163,344 tons; transit cargo 2,878,360 tons; bunker coal shipped, 688,767 tons.

The total number of tons carried was therefore 49.31 per cent. of the total net register tonnage, (or 64.40 per cent. exclusive of river steamers), and was apportioned as follows:—Imports: British ocean-going ships, 1,893,234; foreign ocean-going ships, 1,851,053; British river steamers, 222,256; foreign river steamers, 62,634—total, 4,029,177.

Exports: British ocean-going ships, 1,092,842; foreign ocean-going ships 847,432; British river steamers, 173,483; foreign river steamers, 49,587—total, 2,163,344.

Transit: British ocean-going ships, 1,668,276; foreign ocean-going ships, 1,210,084—total, 2,878,360.

Bunker coal: British ocean-going ships, 248,581; foreign ocean-going ships, 387,030; British river steamers, 43,350; foreign river steamers, 9,806—total, 688,767; grand total, 9,759,648.

REVENUE.

The total revenue collected by the Harbor Department during the year was $274,008.78 as against $302,787.76 (including $2,220 collected under the Sugar Convention Ordinance) collected in the previous year, showing a decrease of $28,778.98:—Light dues, $77,722.04; licences and internal revenue $61,748.33; fees of court and office, $134,533.21; miscellaneous receipts, $5.20—total, $274,008.78.

For purposes of comparison, the amount of decrease, $28,778.98, may properly be reduced by $12,219.58, being amount of storage fees paid in November 1905 by owners of war materials, which had been seized and ultimately restored by this Government, an item of revenue not to be expected again, leaving a net decrease of $16,559.40 to be accounted for. The principal falling off in revenue comes under the heading: junk fees, $1,457; engagement and discharge of seamen, $1,528; storage of gunpowder, yet another sum of $4,769; Sunday cargo-working permits, $12,007; and survey of steamships, $3,815. The principal increases are under light dues, $3,488; fishing stake and net licences, $1,115 and medical examination of emigrants, $3,582.

STEAM LAUNCHES.

On the 31st December, there were 291 steam-launches employed in the harbor, of these, 138 were licensed for the conveyance of passengers etc., 138 were privately owned, 15 were the property of the Government and five belonged to the Imperial Government in charge of military authorities.

Thirteen master's certificates were suspended, two for six months, one for four months, two for three months, two for two months, one for one month, one for six weeks and one for two weeks, one cancelled and two masters were cautioned and discharged, respectively.

Three hundred and thirty-four (334) engagements and three hundred and sixty-four (364) discharges of masters and engineers were made from 1st January to 31st December.

Twelve (12) steam launches were permitted to carry arms, etc. for their protection against pirates, of these 11 were previously permitted and one during this year.

EMIGRATION.

Seventy-six thousand seven hundred and twenty-five (76,725) emigrants left Hongkong for various places during the year, of these, 63,830 were carried by British ships and 12,895 by foreign ships; 134,912 were reported as having been brought to Hongkong from places to which they have emigrated, and of these, 105,780 were brought in British ships and 25,586 by foreign ships.

REGISTRY OF SHIPPING.

During the year, nine ships were registered under the provisions of the Imperial Merchant Shipping Act, and 12 certificates of registry were cancelled. And 412 documents, etc., were dealt with in connection with the Imperial Merchant Shipping Act. The fees collected on these documents, etc., amounted to $1,201.

MARINE MAGISTRATE'S COURT.

Twenty-seven (27) cases were heard in the Marine Magistrate's Court. Breach of Harbor Regulations were the principal offenses. Also four Marine Court enquiries, re the steamers Chu Kong, Hankow, Kinshan and Heungshan.

BOARD OF TRADE EXAMS.

Altogether 130 candidates for certificates of Master (18), First Mate (13), Second Mate (12), First Class Engineer (21), Second Class Engineer (45) were examined. Of these 109 candidates passed and 21 failed.

Some 211 launch certificates were granted for either Master (129), or Engineer (82).

Also four exam nations for pilots' certificates, all the candidates being Chinese, were held during the year, and 13 licenses were renewed and one license previously issued was cancelled at the request of the licensee.

SUNDAYS CARGO WORKING.

During the year, 399 permits were issued under the provisions of the Ordinance. Of these, 126 were not availed of owing to its being found unnecessary for the ship to work cargo on Sunday and the fee paid for the permit was refunded in each case.

The months of September and October accounted for $2,427.50 of the decrease; in the former month after the typhoon of the 18th September, vessels were allowed to work cargo on Sundays without paying fees and in the latter month only one-tenth of the prescribed fees were charged on permits, the remainder of the decrease being shown by the other months of the year.

NEW TERRITORIES.

From 1st January to 31st December, 1906, 9,198 licenses, clearances, permits, etc., were issued at Cheung Chau, 4,081 at Tai-O, 5,953 at Tai Po, 3,156 at Deep Bay, 2,632 at Sai Kung and 3,909 at Long Ket.

The revenue collected by this Department from the New Territories during 1906, was $18,944.25 or $780.55 more than in 1905.

GENERAL.

During the year under review, some important changes have taken place, notably:—the vacating of the old Harbor Office for the present commodious new building, which has alleviated matters considerably for the better working of the Department.

The telegraph service from the outlying lighthouses, viz.; Gap Rock, Waglan and Green Island, has been installed and worked from this building. Additionally, shipping firms have been apprised of the passing of their vessels inward, which hitherto was done by the Eastern Extension Telegraph Co.'s office.

The deplorable loss of life and damage done, due to the typhoon of the 18th September, will be indelibly marked in the annals of the Colony Fifty-nine merchant vessels of European construction suffered in the waters of the Colony, 5 of 1,812 tons foundered, 22 of 22,478 tons stranded, 5 of 1,344 tons broken against sea wall, 13 of 21,420 tons badly damaged, and 14 of 25,131 tons slightly damaged. There were in addition 16 lighters of European construction sunk, and badly damaged, 34 launches sunk, 50 damaged and approximately 1,796 native craft sunk, and in the majority of cases totally lost. It can be safely said that all craft suffered in the harbor, more or less damaged during the blow. The loss of life, I regret to say, must have been excessively high, amounting to approximately 5,000, though there are no positive records to show the actual number that perished.

HONGKONG ROPE CO. (LIMITED)

The twenty-third ordinary general meeting of the Hongkong Rope Company Limited, was held in the offices of the General Managers, Messrs Shewan, Tomes and Company at noon on March 23.

Mr. R. Shewan was in the chair, and there were also present:—Messrs. P. H. White, D. W. Craddock, A. J. Raymond, R. Hancock and R. Henderson (secretary).

The secretary read the notice convening the meeting.

The Chairman said—Gentlemen, We have now to come before you with the report and accounts for the year 1906, copies of which were issued to you on 8th instant, and which with your permission will now be taken as read. There is little in the report that calls for comment. The profit is slightly greater than the previous year's as the price of raw material was more in our favor, and we are, therefore, able to recommend our old dividend of 20 per cent. On the other hand, the high value at which the silver dollar was maintained throughout the year was against us, and considerably reduced our returns from those countries where we have to sell in gold, besides handicapping us in competition with rope made at home, and restricting our sales all round. The accounts are simple, and require no explanation. You will observe that the investments of the reserve fund are stated at the current quotations on 31st December last, and their rise in value passed to the credit of investment fluctuation account. As for the present year, the prospects are, if anything, a shade better. The hemp market at Manila has weakened since the beginning of the year, while silver also seems on the downward grade; let us hope that this promise of better things may be fulfilled, and so enable us to extend our business in every market around us. Our competitors may be able at times to produce a cheaper article, but they only do so by adulterating their fibres, and have never yet been able to offer quality at all approaching that which is turned out by our factory.

There being no questions the Chairman moved the adoption of the report and accounts, which was carried.

Messrs. A. J. Raymond, H. P. White, D W. Craddock and Dr. J. W. Noble were re-elected directors on the motion of Mr. Hancock, seconded by Mr. Shewan.

Messrs. W. H. Potts and A. O'D. Gourdin were re-elected auditors on the motion of Mr. Craddock, seconded by Mr. White.

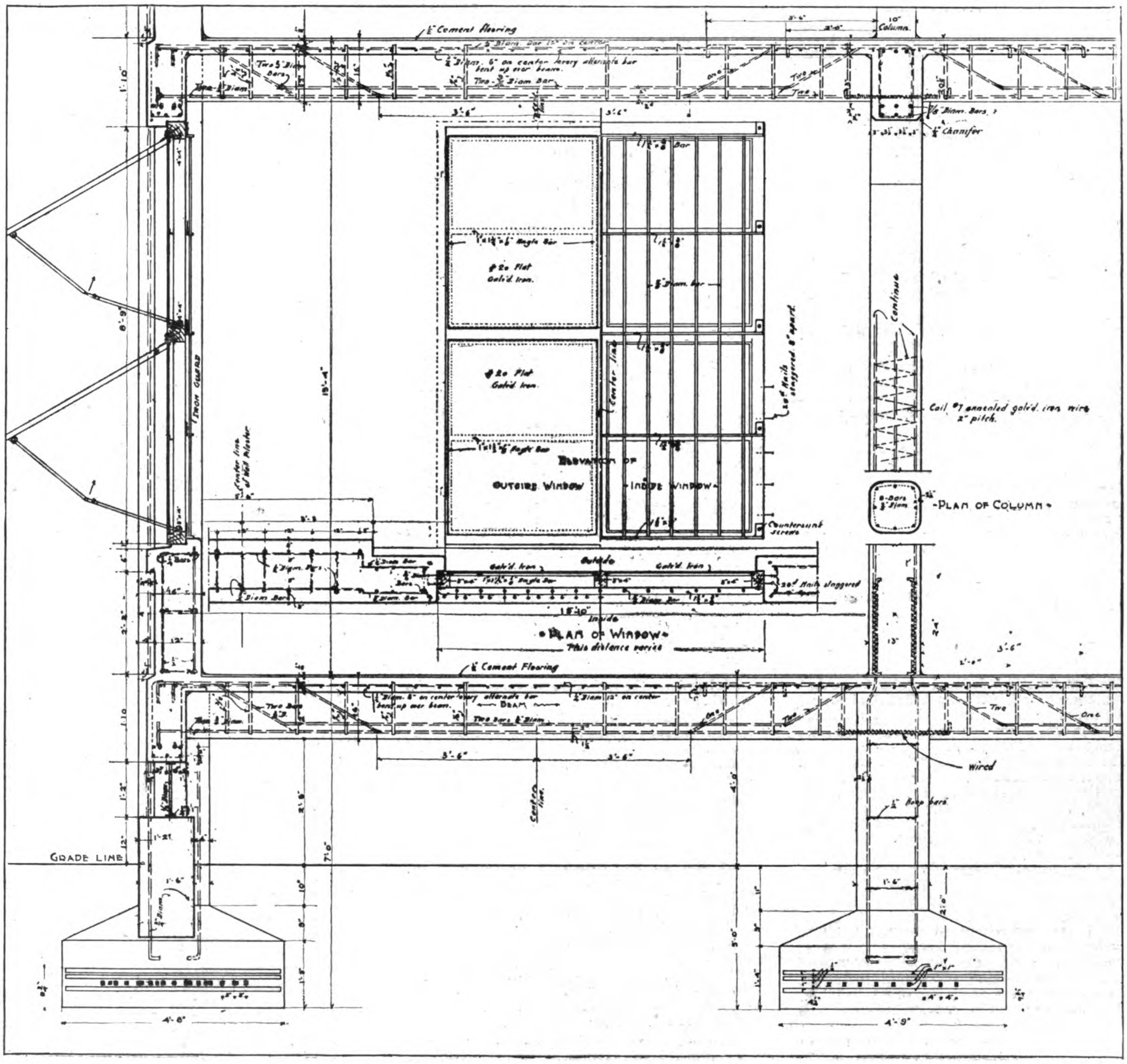
WATER SYSTEM AND ELECTRIC LIGHT AND POWER FOR ZAMBOANGA

The provincial engineer of the Moro province, Mindanao, has prepared estimates for a water system for the city of Zamboanga to cost $53,658. In connection with the water system he proposes to provide power for an electric plant and estimates the additional expense at $42,625 or a total for the water and electric system of $96,253. The point selected for the in take is on the Tumaga river about 24,000 feet from Zamboanga and 150 feet above sea-level.

NEW INSANE WARDS AT SAN LAZARO HOSPITAL, MANILA, OF REINFORCED CONCRETE

The construction of the new insane wards at San Lazaro Hospital by the Philippine Government is being watched with interest by all believers in permanent construction in the Far East. This is the first insular government building to be built of reinforced concrete in the Philippines although the government has been successfully engaged for some time in constructing bridges and culverts on the leading highways in the islands of a permanent character by the use of reinforced concrete. Constant care is necessary to properly supervise the work. Every mixture of concrete is inspected and every rod of steel as it goes in place is subjected to the most rigid tests so that there will be no opportunity for any weak point to develop. The workmen available are not familiar with the work, but the contractors are more than pleased with the interest taken in mastering the details, and it is conceded that in a short time the lack of available skilled workmen for this class of construction will not be an obstacle to the general use of reinforced concrete throughout the islands.

This new building is an L-shaped structure in two stories, the length of each wing being 76 feet and the width 40 feet. The entire floor surface of each story is devoted to a single ward, spaces for bathrooms and water closets being partitioned off in one corner. For

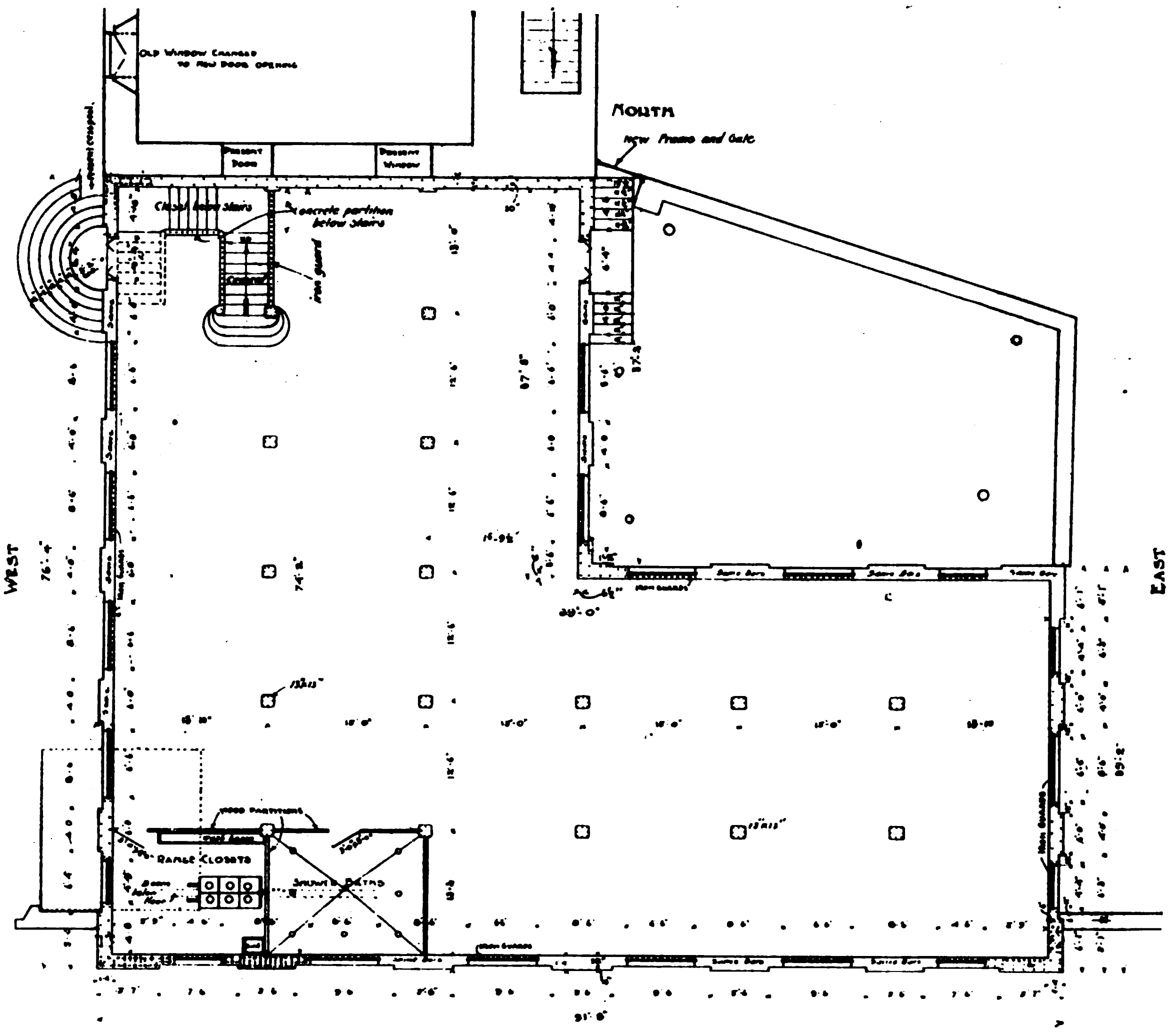


DETAIL SHOWING BAR-REINFORCEMENT CONSTRUCTION IN THE NEW INSANE WARDS AT SAN LAZARO, MANILA, P. I.

economy of administration, one end of the building adjoins directly the end of the existing buildiing, to which the attendants and nurse have free access.

The new wards are intended entirely for males. The recreation ground which adjoins the building on both sides and is inclosed by the existing stone walls is available for all the occupants of this structure.

The form work for this structure is prepared by Chinese carpenters and all the other work, including the mixing and placing of concrete and the setting in place and wiring of the re-inforcement rods, is done by Filipino workmen, the native workmen seeming to take very readily to the placing of the rods and the wiring of the intersections with annealed iron wire, this work being really not unlike construction to the B. W. Cadwallader Company, the lowest bidders, for the sum of ₱32,044, and the cost of the building, including reinforcing steel and plumbing fixtures which were provided by the government, will amount to, approximately, ₱45,000. The inspection of the work is under the direction of the bureau of public works, Mr. J. C. Koch, assistant engineer of that Bureau, being the chief inspector.



GROUND FLOOR PLAN OF THE INSANE WARD AT SAN LAZARO, MANILA, P. I., NOW BEING CONSTRUCTED OF RE-INFORCED CONCRETE

The first floor is at a level of about five feet above the ground, with a ventilated air space underneath. The interior corners at the floors and walls are all rounded in order to facilitate cleaning and disinfection.

The construction throughout is of reinforced concrete, the foudations, walls, floors and even the stairway being of this material. The amount of wood used in the building is thus reduced to a minimum, the only wood used being in the window frames and the compression members of the roof trusses. In accordance with the policy recently determined upon by the insular government, for buildings of a permanent character, native hard wood of the first or second group is used.

This is the first reinforced concrete building constructed by the insular government and it is thought to mark the beginning of a new policy for construction of public buildings. While comparatively an unimportant building, its location being at a considerable distance from the street, its construction is being watched very carefully by not only the inspectors in charge but also by contractors and the public who are interested in this form of construction.

with bamboo where the intersections are wound with bejuco.

Precautions are being taken against the action of the sun on the fresh concrete by protecting the walls with burlap which is kept moist, the specifications requiring the protection of freshly laid concrete for a period of seven days. The concrete floors are protected from the same injurious effect by covering with about two inches of sand, which is wetted down occasionally with a hose.

In the general treatment of the exterior, effort has been made, as far as possible, to produce a design harmonious with that of the old structure which was built, probably two hundred years ago, of masonry of the most substantial appearance. The wide buttresses which appear in the old part, running through two stories, are recalled in the new design, the construction of reinforced concrete being logically expressed on the exterior of the building in the form of wide pilasters.

The complete drawings and specifications were prepared in the office of Mr. W. E. Parsons, consulting architect. The contract was awarded

A. K. LA MOTTE'S SCIENTIFIC WORKS

Mr. A. K. La Motte, the veteran bookseller and stationer of Manila, whose up-to-date establishment is situated at 104 calle Real, Intramuros, has always made a specialty of keeping on sale all the latest and most desirable scientific works, besides a most complete stock of the latest publications by well known authors along other lines of thought.

In addition to his modern book and stationery establishment, Mr. La Motte has established headquarters for Moro, Igorot and other Philippine curios. He is daily in receipt of orders from all parts of the known world, and his increasing trade in this direction speaks eloquently for his splendid service.

Mr. La Motte has had a wide business experience in America and the Philippines and may be termed a self made man. He started in the book and stationery business in 1903, and every year has been marked by a steady increase in patronage.

SEMI-ANNUAL REPORT OF YOKOHAMA SPECIE BANK

At the fifty-fourth semi-annual meeting of the directors of the Yokohama Specie Bank, held March 9, Chairman Yamakawa made an interesting address on business conditions in Japan during the latter half of the year 1906. There were present at the meeting Mr. Yoshida of the Imperial Household Department and Mr. Nagahama of the Treasury Department. In presenting this report the chairman said:

"As you well know, Mr. Takanashi, the president of this bank, has been abroad since September last under the special i nstructions of the Government, and is now in London. He profoundly regrets being unable to be present on this occasion, but his absence is quite an unavoidable matter. I, on behalf of the president, preside at this meeting, which I feel to be a great honor.

This being the fifty-fourth semi-annual meeting of this bank to introduce the accounts of the business done during the last year, I have to give a report on the financial situation of domestic and foreign countries as well as of the business conditions of the bank. As explained at the general meeting which was held in September last, profound caution was entertained and all capitalists maintained a circumspect actitude during the first half of the year, notwithstanding expectations of the starting in considerable numbers of various enterprises; and under these circumstances, the financial situation remained inactive in spite of the favorable condition of the money market throughout the first half-year. A brisker aspect appeared in August and September and gradually the prices of various shares went up remarkably, which stimulated the promotion of general business undertakings. As a result, most of the associations already existing decided to increase their capital and many new companies were organized; and thus the fever of promoting new enterprises both in industry and commerce was the natural effect of the revival of the financial position which had continued dull for a long time. It was unavoidable that newly-established companies should include many started merely for speculative purposes and that the distinction between genuine and false could not be made among the projects which appeared so suddenly. Warnings were often uttered as to the situation, and this bank conducted its business with caution. Most of the new associations, however, are still under investigation and are not yet in the way of commencing practical business, so that the funds needed for such projects are not yet collected. As there were redemptions of Exchequer Bills and other bonds in succession, deposits in the leading banks were further increased. Credits by the banks were not in accordance with the expansion of the deposits, and consequently all the banks found difficulty in employing their funds. The Specie Bank being different in its business nature from the various other domestic banks and principally attending to foreign trade, had favorable opportunities without leaving its funds unemployed in hand.

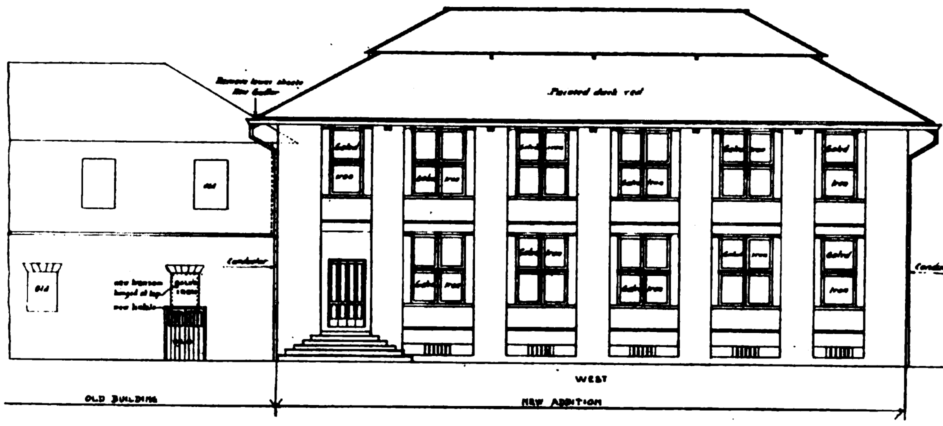
Turning to the condition of foreign trade during the period, the confusion caused by the war has entirely passed away, and all financial circles have been restored to their normal state. As agricultural work was productive, foreign business developed far more than was expected. The excess in imports which had been experienced for many years was changed to an excess of exports. Among the exports, business in raw silk was specially successful since the beginning of the season and excellent prices were maintained to an extent not seen for some years past. During several months, most of the staple was exported. In the half-year, the exports exceeded by Yen 32,000, in round numbers that of the previous period. The whole export of last year amounted to over Yen 110,000,000, such success in foreign business being rare in Japan.

During this period, the foreign trade was: Yen 246,900,000 in exports and Yen 195,700,000 in imports. Comparing these figures with those of the corresponding period of the previous year, the exports show an increase of Yen 63,000,000 as there were increases in raw silk, habutae, cotton yarn, camphor, porcelain, earthenware, etc. The imports decreased by Yen 6,000,000 owing to the diminished business in iron, leather, hides, etc., for military use as well as a decrease in raw cotton, but in spite of increases in sugar, kerosene oil, oil-cake, woollen cloth, machinery, etc. This considerable change in the foreign trade is certainly to be attributed to the industrial development of Japan, and to the favorable financial situation in the countries of Europe and America. Money transactions in foreign business were quite different. The exports of gold and silver amounted to Yen 13,300,000 and the imports to Yen 7,900,000. The excessive exports seems to have been due to the demand for gold bullion in China and Hongkong for use as gold leaf, and other ornamental purposes, and also to the change in exchange rates between Occidental and Oriental countries.

Looking at foreign financial circles, we see that the convulsions which arose from the Russo-Japanese war, the Morocco affair, etc., have absolutely vanished and commerce and industry in the countries of Europe and America have been alike restored to their original healthy condition and are in a prosperous state. The agricultural crops of America, Egypt, etc., were extraordinarily abundant and consequently commerce and industry were favorably affected. As a result, the further need of business funds was apparent. In New York, the money market became difficult and the American government, therefore, carried out measures of importing gold bullion to relieve the tension. Exports of gold from London to New York, Egypt, Brazil, etc., were repeated and the gold in the Bank of England grew scarce. In October, the reserve was £27,000,000. The Bank of England raised its interest rates three times, finally to 6 per cent, which had not been seen since the war in South Africa. The discount rate, which was originally 3 per cent, also went up, varying between 5 and 6 per cent. The severe financial conditions experienced in Great Britain were not alone due to inevitable causes at home but arose from the situation throughout the world. Again turning to the Orient, inundations were experienced in the Yangtze valleys. Famine is now prevalent in South China. Distress from drought afflicts North China. In Hongkong, severe difficulties were sustained as the result of the bankruptcy of several cotton traders and a fatal storm. Business in China was not always favorable, and owing to the rise in silver, exports were dull. In Manchuria, peace and order were gradually restored and trade between Japan and that region is developing. The difficulties experienced during the war were well surmounted so that business is generally quiet.

The advance in the price of silver is still maintained. In November last it reached thirty-three pence, which is higher than for some years past. As to the rise, there are several causes. The principal is that the output of silver was relatively smaller than that of gold in late years and consequently a change was made in the price of silver. Futher, owing to the prosperous agricultural conditions last year in India, the need of silver increased in a permanent fashion while also the American government declared its intention to purchase a hundred thousand ounces of silver every week. Further, Mexico, which had been exporting silver for many years, changed her attitude and purchased the metal from foreign countries as the effect of the re-organization of her financial system. Lately as the result of a change in living conditions throughout the world, silver for making articles of luxury has come into great demand, which fact seems to have stimulated the rise in price.

The financial condition abroad and at home is as explained above. Exchange, there is no doubt, has been affected by the rise in gold and silver. Yet the foreign trade in Japan, fortunately, has been favorable and the business of the Specie Bank was also successful. The net income in the period was Yen 2,217,239.20, to which the balance, Yen 793,908.04, brought from the previous account, was added, making a total of Yen 3,011,147.24, The expenditures for the proposed establishments of the various branch offices were fixed at Yen 1,400,000 at the previous meeting, for which purpose a million yen was set apart as a reserve. There is a further sum of Yen 400,000 required for that expenditure. On the other hand, the price of various commodities has risen. Perhaps a further shortage will have to be met at the time when construction is commenced. Consequently the directors decided to make a espcial reserve as arranged in the statement of accounts. In conclusion, I am glad to add some words as to our business in Manchuria. There are no special matters to be explained to you. In October last, an Imperial Edict was proclaimed with regard to silver notes in China and Kuan-



WEST ELEVATION SAN LAZARO INSANE WARD, MANILA, P. I.

tung. The bank will use its utmost efforts in accordance with the law. In February this year, a branch office was provided at Changchun for the foregoing purpose.

For the improvement of business, the payment—three million yen—of the third shares is to be made as already intimated to the shareholders. After the additional capital is collected the paid-up capital will amount to twenty-four million yen.

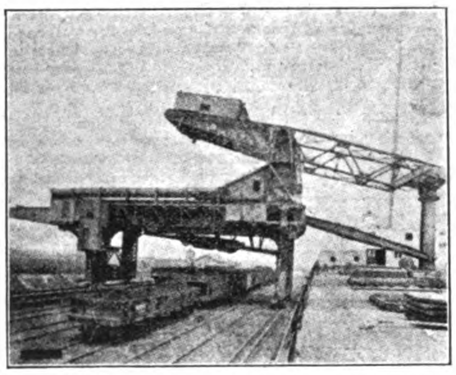
To develop the business, the directors decided to raise the number of directors from seven to ten, for which proposal reasons are now laid before you. The accounts follow:—

	Yen.
Gross income including the balance, Yen 793,908.04 brought from previous accounts	10,447,288.75
Expenditure	7,436,141.51
Net profit	3,011,147.24
Legal Reserve	350,000.00
Special Reserve	500,000.00
Dividend (Yen 6 each per old, new and second new share and Yen 4.50 per third new share)	1,260,000.00
Balance carried forward to next account	901,147.24

Viscount Y. Mishima, Mr. C. Kawashima and Mr. H. Bekki were elected additional directors.

A MODERN UNLOADING MACHINE

At the docks of the Pennsylvania Railroad Company in Buffalo, New York, says *Commercial America*, there has recently been installed by the Wellman-Seaver-Morgan Company, of Cleveland, Ohio, a Hulett Automatic Ore Unloader which, on account of its large capacity and some of the details of its construction, is remarkable. The grab bucket of this machine has an average capacity of ten tons gross of

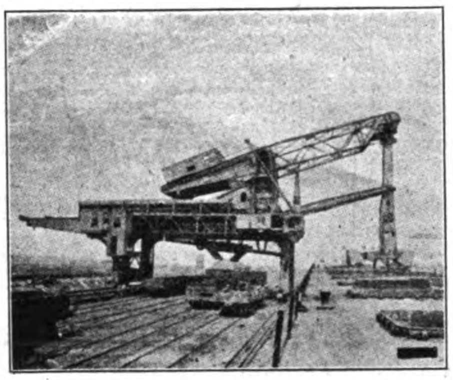


HULETT AUTOMATIC ORE UNLOADER READY FOR WORK

iron ore and the spread of the bucket under ordinary circumstances is 18 feet. By use of a telescopic motion this spread can be considerably extended, enabling it to cover a large area in the hold of a steamer. In this way it can be made to reach more than half way over the center of one hatch to the center of another hatch on the steamer when these are spaced 24 feet on center.

The grab bucket is carried at the end of a vertical dependent leg suspended from a walking beam which may be raised or lowered as desired. The bucket leg is mounted at the top on trunions so that the bucket may be rotated while operating in the hold of a boat and in this way it is possible for it to reach out in any direction. The walking beam in turn is so mounted that it may be carried out over the hold of the boat and back again over the dock at will.

In operation the grab bucket discharges into a special bucket car or traveling hopper provided with folding chutes for discharging the ore, either into railway cars or into the storage pit at the back of the dock. This bucket car travels back and forth as required and is automatically discharged upon reaching the desired dumping point.



HULETT AUTOMATIC ORE UNLOADER AT WORK IN THE HOLD

The unloader is operated by electric motors receiving current through sliding contacts. The motor for opening and closing the bucket has a capacity of 85 h. p.; that for hoisting the walking beam 150 h. p.; and that for traveling in and out 50 h. p.; while the special one used for operating the bucket itself and for moving the machine has a capacity of 75 h. p.

One of the cuts presented herewith shows the machine with the grab bucket open and the chutes of the bucket car in position for discharge. The other shows the position of the walking beam when the unloader leg and bucket are at work in the hold of the boat and when the chutes of the bucket car are closed.

EXPORTS AND IMPORTS OF THE STRAITS SETTLEMENTS

The report of the exports and imports of the Straits Settlements for the last quarter of 1906 has just been issued by the Straits government and contains much valuable information on the growth of trade in that important section of the Far East. According to the statistics furnished the total value of merchandise imported during the quarter exclusive of treasure amounted to $82,697,478 or £9,648,038.

The sterling rate has been calculated at 2s. 4d. for this quarter, as compared with 2s. 2d. for the corresponding period in 1905. The returns for the last mentioned quarter were $81,687,403 or £8,849,465. Thus it will be seen that the increase was $1,010,075 or £798,573, but any comparison in sterling is not strictly applicable to goods which have their origin in silver currency countries.

Singapore imports rose from the comparative quarter in 1905 from $58,775,173, or £6,367,308 to $59,604,312 or £6,953,837.

The Penang returns were: For the 1906 quarter, $21,864,287=£2,550,832. For the corresponding three months of the previous year $21,807,779=£2,362,508.

Malacca imported in last year's quarter $1,228,879=£143,369. For the same period in 1905 the imports were $1,104,451=£119,649.

The only imports for Singapore that showed an increase was under the heading of "raw materials," which expanded from $20,729,842 or £2,245,732 in the last quarter of 1905 to $23,413,133 or £2,731,532, in the three months under review. Under "live animals, food, drink, and narcotics" the imports for the last quarter were $23,413,133=£2,731,532, as compared with $20,729,842=£2,245,732 in the corresponding period of 1905. The "manufactured articles" entering the Southern Settlement fell from $14,676,952, or £1,590,002 in 1905 to $13,410,282, or £1,564,533 in last year's quarter.

The returns for Penang show that there only was a decrease in the imports of "raw materials," the figures being $11,136,452=£1,206,448 and $10,306,776=£1,202,456 during the last quarters of 1905 and 1906, respectively.

In the last quarter of 1905, the value of live animals, food, drink, and narcotics brought into Penang was $6,680,023, or £723,669; and the figures for the corresponding period of the following year show an increase of $227,260 or £72,847.

The value of imported manufactured articles expanded from $3,991,304 or £432,391 in the fourth quarter of 1905 to $4,730,228 or £551,860 during the corresponding three months of last year.

The imports into Malacca in "manufactured articles" show a shrinkage of from $214,860 or £23,276 in the last quarter of 1905 to $186,790 or £21,792 during the same period of 1906. This decrease is probably due to the completion of the railway. There was a great increase of "raw materials" entering the Settlement. It was nearly double—the figures for the 1905 quarter being $67,156 or £7,276, as compared with $113,167 or £13,203 during the quarter under review. Malacca received live animals, food and drink, and narcotics valued at $822,435 or £89,097 during the last three months of 1905, and in the same quarter of last year to the value of $928,922 or £108,374.

The import of opium (Benares), which amounted to $2,333,775 in the 1905 quarter, fell to 1,933,750 during the corresponding months of last year.

Coming to exports, we find that the total value, exclusive of treasure, for the whole period under review, amounted to $75,771,937 or £8,840,059, showing an increase of $5,383,393 or £1,214,635 over the 1905 quarter. For Singapore, the returns for the last year's and the preceding year's periods were respectively $51,625,718 or £6,023,001 and $48,978,787 or £5,306,034. Penang exported merchandise valued at $20,429,877 or £2,213,236 in 1905, while the figures for 1906 are $23,135,691 or £2,699,195.

Malacca sent out goods valued at $1,018,258 = £117,863 in the 1906 quarter, as against $979,880 or £106,154 during the same months of the previous year.

The exports from Penang of live animals, food and drink, and narcotics increased from $6,945,186=£752,395 during the last quarter of 1905 to $7,400,077=£863,342 in the corresponding months of last year.

The value of raw materials shipped from Penang during the last three months of 1906 came to $13,229,811=£1,543,478, an expansion as compared with $11,776,461=£1,275,783 in the same period of the previous year.

The export of manufactured articles from Penang during the fourth quarter of 1906 amounted to $2,506,073=£292,375, an increase of $797,843=£17,317 on the same period of 1905.

One very interesting item was an increase of nearly three millions dollars in the value of the export of metal from Singapore— the actual figures were $12,299,995, or £1,435,000, for the 1906 quarter, against $10,444,275 or £1,131,463 of the preceding year's same three months. Tin alone showed an increase of $2,860,671, and for Penang $887,833 over the figures for the 1905 quarter.

The report throws some light on the increase of the rubber industry, for it may be mentioned that Para rubber exported from Singapore doubled in value—rising from $230,680 to $520,720. Penang shows a remarkably larger proportional increase, as in the 1905 quarter the export was only $44,230, but during the corresponding period of 1906 it rose to $207,333.

Malacca shows $13,800 for the quarter under review against $8,300 for the corresponding months of 1905. The total exports of Para rubber from the Colony has risen from $283,210 to $741,853 for the last quarters of 1905 and 1906, respectively.

No Rambong rubber was exported from the Colony during the quarter of 1905, but in that of 1906 Singapore alone sent out some valued at $2,000.

The export of opium (Benares) from the Colony during the last quarter of 1906 amounted to $1,586,614, having fallen from $2,088,892, the value during the corresponding period of the previous year.

THE OTARU LUMBER CO., LTD.

The development of the lumbering industry in Japan has attracted wide attention and no company has met with the success that has attended the enterprise of the Otaru Lumber Co. In this connection, the address of Manager Director Tanaka at the last shareholders' meeting, in which he reviewed in a most intelligent manner the work of the company and its prospects for the future, will be of interest. He said:

"I am glad to say that the confidence placed by the general public in the future of this Company at the time of the organization has been more than realized, and while the dividend for the last term has been cut down to 15 per cent., the accrued profits of more than yen 34,000 during its short operation are sufficient to cover the increase of the said ratio to 40 per cent. should it be so desired. It is no wonder that the shareholders should have moved to increase the capital of yen 1,500,000 to yen 6,000,000, the reason assigned being the advisability of enlarging the present plant in such a way as to make it possible to cope with the almost unlimited demand for lumber in the future. The desire so strongly advocated by the shareholders was subsequently discussed at the Directors' Meeting, and the Adviser of the Company (Baron Shibusawa) was also invited to express his views on the subject, and the conclusion attained was to the effect that, in consideration of the rapid changes now being witnessed, it was most appropriate to strengthen the position of the Company. The importance of converting lumber into a marketable shape was not by any means neglected, and at the same time the advantage also of speedily transporting such bulky commodities to different localities, and avoiding as much as possible the too large accumulation of stock at any particular point was considered to its fullest extent. To do this effectively, the only course was to do the transporting ourselves by purchasing steamers specially adapted for such purposes, and this it was decided to enforce, as we were more or less at the mercy of the shipowners when negotiating for the shipment of our production from other than well-known ports of Hokkaido. The next step in importance was to improve the loading facilities at Otaru in order not only to reduce cost of loading to the minimum, but to effectively connect our various sources of supply with the disbursing medium. With the supply thus assured the consuming market has by no means been overlooked, and it has been wisely decided to establish lumber yards in Tientsin, Shanghai, Hankow and other important points in China. In view of the resolutions passed by the shareholders, and in which the Board of Directors entirely concurred, three steamers of about 3,000 tons each have already been purchased, and one or two others are still under consideration. The purchase of land also, to the extent of 10,000 tsubo, the installation of a 400 H. P. electric plant to be generated from the refuse of the mill, the petition for the laying of a tram line between the plant and the pier have all been attended to, and the last is now in the hands of the proper authorities. In order to safeguard against any unusual competition it was deemed advisable to purchase 50 per cent. of the stock of the Japan Anti-Decomposition Wood Co., Ltd., of Tokyo, and for this purpose two-thirds of the paid-up capital was appropriated with the explicit understanding to have the interests of our Company fully represented in the Directorate of the said concern. To Baron Shibusawa are due the negotiations which made it possible for us to connect ourselves with the Company in question, and it may interest you to know that this enterprise was originally founded by such well-known capitalists as the house of Prince Mori and Mr. K. Amenomiya, and the same subject was first brought to our notice through the latter gentleman, and subsequently perfected by our Adviser who is no other than the Baron.

REPRODUCTION OF LAUAN. THIS BED OF SEEDINGS IS IN A SHADE DENSITY OF ABOUT 0.75

"Regarding the actual operations in the future, the immediate result of what is commonly known as their winter term covering the intervening months between November and April or May the following year, include 1,500,000 sleepers, and 4,500,000 cubic feet of lumber, and of this lot 600,000 pieces of the former and 130,000 cubic feet of the latter have already been concentrated in a convenient locality, and with marked symptoms of a large demand in the near future a prosperous year is almost assured. Of sleepers, 1,200,000 pieces have already been booked, and of this quantity about one-half will be exported to Mexico, and the other half to China, and although the sales of lumber so far do not exceed 700,000 cubic feet, the comparative smallness can be easily explained. As a matter of fact at least 150,000 cubic feet will be required to feed our own mills, and with the prospect of an increasing demand the seemingly large stock will be reduced in a considerably short time.

"To turn to the important item of profit and loss, the prices at which the sales have been so far

closed are much higher than at first estimated and the accrued gain of yen 352,800 will not only provide for declaring a dividend of 15 per cent. on all the paid-up shares of the original capital of yen 1,500,000, and on one quarter or yen 1,250,000 called in of the new shares, but will also leave a comfortable margin to be carried over to the next account.

"Moreover, this estimate does not include the operations during the so-called summer term, and other profits such as must be derived from our own mills and miscellaneous sources are entirely overlooked, and when all these items are added on to what has already been earned surely the total must produce a most satisfactory result.

"The forest area available in Hokkaido exceeds 4,000,000 cho, and the yearly lumbering of nearly 200,000,000 cubic feet cannot materially reduce its productive power, as these figures are based on the alternate cutting system extending over a period of one hundred years, and which is ample time for the full growth of the trees that are to replace their predecessors. Needless to say the calculations are all the result of years of study and personal experience devoted to this industry, and the more we go into it the more are we convinced of the very bright future before us in Hokkaido."

FIREWORKS WITHOUT FIRE

The Electric Steam Color-Scintillator, a recent novel invention, promises to supersede by electrical displays the old time fireworks and eliminate many of the dangers connected therewith. It is an invention of an illuminating engineer in Lynn, Mass., and is described in the *Western Electrician* (Chicago) as follows:

"This device consists of a bank of powerful naval electric-light projectors or search-lights, arranged in such a manner that the rays of light can be projected in any desired direction on jets of steam, which are emitted from a series of iron pipes located at a suitable distance and elevation from the projectors. These projectors vary in capacity and are of different sizes, varying in diameter from about 12 to 30 inches. The former are directed so as to illuminate the jets of steam where they issue from the pipes, while the larger projectors are pointed upward and cast their light upon the great banks of rolling steam, extending like a canopy above the jets. Mounted in front of each of the projectors are large rotating gelatin screen-disks of various colors.

"The steam is generated in a portable steam-boiler of any desired capacity, set about 50 or 100 feet from the projector platform, this distance, however, depending upon the relative elevation of the steam-nozles to the projectors. The steam is forced through ordinary iron pipes of sufficient strength to withstand about 50 to 75 pounds pressure per square inch, which are placed near to or directly over the boiler, to which they are connected in such a manner that the steam is forced through several openings or nozles. Some of these nozles are inserted in vertical and horizontal pipes, which are stationary while others are placed on a circular structure of pipework arranged to revolve by flexible attachment. All of them, however, are located on the extreme top of the structure, and above the steam-boiler.

"Objects can be made to appear or to disappear almost instantaneously, while, on the other hand, they can be made to appear as tho dawning and fading, in a most ethereal manner. This can be appreciated while observing a great American flag about 50 feet square subject to these changes. It is expected that flags of every nation will be exhibited this year at the Jamestown Exposition in this novel manner. The successful operation of this device depends largely upon the artistic taste and originality of the operator, for the way in which the colors blend with and succeed one another is due to the operator's skill.

"The most necessary operating condition is a clear atmosphere. From the viewpoint of outdoor illumination, this device may be regarded as entirely unique; and it will probably be the most admired of all the illuminating attractions at the Tricentennial Exposition, at Jamestown, Va.

"The beauties of these superbly lighted banks of clouds will be enhanced by the fact that the eyes of the spectators will be shielded from the glare of the arc and other lamps. All the arcs and the 200,000 incandescent lamps will be hidden from view, and the exposition will appear as if lighted from some unknown source."

THINGS JAPANESE

By Walter J. Ballard.

The largest dock in Japan is at Nagasaki, 728 feet; the next is at Yokohama, 552 feet, and the third largest is at Hakodate, 534 feet. The floating dock at Nagasaki is 412 feet long and is capable of floating a dead weight of 7,000 tons. Another and larger floating dock is now being built by the same company.

Shipbuilding in Japan employs 10,000 men at Nagasaki, 8,000 at Kobe and 4,000 at Osaka. All three yards are more than full of orders.

The Nippon Yusan Kaisha (Japanese Steamship Company) is now in strong competition with foreign steamers on the Swatow-Bangkok line, the Shanghai line, the Australian line and the Shanghai-Hankow (China) line.

Subsidies are given by the Japanese government on all ships constructed in Japan for the Japanese. The total amount allowed this current fiscal year (March 31) is $361,350. The amount is not large, but persistence in that plan has given Japan what the United States lacks—an ocean-going merchant marine.

At the end of 1905 Japan had 939,000 tonnage in merchant steamers and 336,000 tonnage in merchant sailing vessels, a total of 1,275,-000 tons, or 298,000 more tonnage than at the end of 1903.

Amoy, China, continues to lose the Formosan tea trade with the development by Japan of Keelung Harbor, and making that the tea port of Formosa. The ultimate object is to make Keelung Harbor accessible to large trans-Pacific steamers. The Japanese have driven British ships—three steamer lines—entirely out of the Formosan trade.

The number of Chinese becoming Japanese subjects is surprising. Japanese Consuls in China have the power to confer Japanese citizenship upon Chinese subjects. In the Chinese treaty ports there are 729 Japanese business houses and 16,910 Japanese. They outnumber Americans there nearly five to one.

The Nippon Yusan Kaisha is having built six steamers for the Australian trade, four of which are of 8,500 tons each; three of 3,500 tons each for the Kang-tse service and two of 2,700 tons for use between Japan and Shanghai.

The Shogyo Shimpo, one of the largest newspapers in Japan, prophesies that in a few years Japan will practically supply China with all the merchandise she imports. The increase in Japan's China trade is ascribed by *The Shogyo Shimpo* to the aid given the merchant marine of Japan. The paper uses the declining American merchant marine as its "horrible example" of national neglect.

Special Agent W. A. Graham, clerk of the Bureau of Manufactures, reports that there is an excellent opening in Japan for the sale of power looms.

Japanese thrift continues. Savings bank deposits December 31, 1905, were $16,500,000 less than July 31, 1906. That much gain in only seven months evidences thrift. In the same period bank loans increased only by $7,000,000.

In the nine months ended September Japan's export of gold increased $2,500,000, her imports of the precious metal increased $8,250,000, a gain of $5,150,000.

When Japan after the war with China, says *The Anglo-Japanese Gazette* of London and Tokio, took possession of Taiwan (Formosa), the means of transportaton on the island were most primitive, but three years later sixty miles of railway had been opened for traffic, carrying in 1898 265,000 passengers and 23,000 tons of merchandise. By 1905 the mileage was 232 miles, carrying 1,144,700 passengers and 350,000 tons of freight, with receipts amounting to $556,000 a year.

In the first half of this year the net profits of the Yokohama Specie Bank were $6,235,000, against $4,961,000 in the last half of 1905, an increase of $1,274,000.

The Bank of Japan has five times as much cash on hand as its entire capital stock, the figures being $15,000,000 and $75,000.000 respectively. This is the bank which takes care of the Japanese government's finances.

Kobe Harbor, Japan, is to be greatly improved, with four jetties (one 1,620 feet long and 360 feet wide) roofed and equipped with electric lights, 130 cranes and twenty-two miles of railway, connecting the jetties with the existing lines, about 110,000 tsubo of land reclaimed from the sea, other jetties, a 3,240 foot breakwater and a three-mile railway for Chinese and Corean shipping.

In 1903 Japan imported $500,000 worth of boilers, in 1904 $850,000 worth and in 1905 $1,315,000 worth. The United States and England made nearly all the sales.

Osaka has seventy factories making buttons, with yearly exports thereof amounting to $500,000.

JAPAN'S FORMOSAN TRADE

The economic relations between the Japanese mainland and Formosa are steadily becoming closer, says *The North China Daily News*. Exports to foreign countries from Formosa decreased in 1906 to Yen 9,000,000 against Yen 10,000,000 in 1905 and Yen 12,000,000 in 1904. But exports to the mainland from the island increased last year to Yen 18,000,000 from Yen 10,000,000 in 1904 and Yen 13,000,000 in 1905. On the other hand, imports to the island from foreign countries stood at Yen 12,000,000 in 1906, against Yen 12,000,000 in 1904 and Yen 10,000,000 in 1905, in round numbers, showing a fractional decrease. But imports from the mainland aggregated in 1906 Yen 15,000,000, against Yen 10,000,000 in 1904 and Yen 13,000,000 in 1905. Thus the volume of exports and imports between the mainland and Formosa is increasing at the cost of that between Formosa and foreign countries. In this respect, Formosa may be styled a channel for the purchase of food stuffs and raw materials for the mainland and an excellent customer of manufacturers of the mainland. As to transactions of Formosa with foreign countries, exports to China are of a downward tendency. But China continues to head foreign countries. Formosa's exports to China in 1906 were a little less than Yen 5,000,000 and imports from China a little above Yen 6,000,000. Exports in February amounted to Yen 33,421,563 against Yen 26,487,048 in the corresponding month of 1906. This makes the total from January of Yen 61,793,485 against Yen 51,-470,231 in 1906. Imports during February stood at Yen 37,976,983 against Yen 32,079,537 in the corresponding month of 1906, making the total from January Yen 78,332,158 against Yen 66,302,856. Exports during the first ten days of March amounted to Yen 10,082,000 and imports to Yen 14,312,000, keeping up an excess of imports by Yen 423,000. This excess from January now comes up to Yen 20,819,000. An efflux of gold and silver from January till March 10 is put at Yen 1,000. The displacement of incoming Japanese vessels during January and February is 1,337,626 tons and that of foreign vessels 1,764,922 tons, making the total of 3,102,548 tons, against 2,386,598 tons in the corresponding two months of 1906.

AMALGAMATION OF SIAM RAILWAYS

The Tachin Railway and the Meklong Railway in Siam have amalgamated. This was agreed upon at the half-yearly meeting of the directors of the Tachin Railway held recently the report of which follows:

The ninth half-yearly meeting of the shareholders of the Tachin Railway Co., Ltd., took place at the Company's office, Klong Kut Mai, Phya Phipat Kosa, Chairman of the Board of Directors, presiding. There were also present Messrs. J. Mackay, C. Sandreczki, C. Kramer, C. S. George, (Directors), V. Gedde, Ch. Sommer, E. Florio, A. Barnholdt, V. Henriksen, F. Stewart, G. Salvatore, D. McGlashan, W. S. Smart, W. Muir, Swanson, H. Hooker, Phra Ranta Chakar, with Mr. A. Bachfeld, acting secretary.

After the minutes of the previous meeting were read and confirmed the Directors' report for the half year ending December 31st, 1906, was submitted.

The report after noting that the accounts had been audited went on to state:—

"The net profit for the period, after deducting from gross revenue all expenses and the sum of Ticals 24,838.49 for depreciation, concession redemption, sinking fund, debenture interest, etc., is Ticals 36,194.77. Your Directors recommend that a dividend of 3½ per cent. for the six months be declared, thus absorbing Ticals 30,800—and the balance, Ticals 5,394.77 be carried forward. The work of relaying the permanent way with additional sleepers proceeds and about two-thirds of the length is finished. We are glad to note a steady increase in the receipts and have every reason to believe this will be maintained. According to the Articles of Association all your Directors now resign, but offer themselves for re-election, except Mr. Em. Kinch and Mr. J. McEwen, who have returned to Europe."

On motion of Mr. Mackay, seconded by Mr. Gedde, the balance-sheet and Directors' report were adopted.

NEW DIRECTORS

The old Directors were all re-elected and the two vacancies referred to in the report were filled by the election of Messrs. L. T. Leonowens and A. Lessler.

There was no other business before the meeting and the third annual meeting of

THE MEKLONG RAILWAY CO.

was then held, Phya Phipat Kosa presiding. In addition to those already named there were also present Messrs. T. M. Upton, T. Judge, L. T. Leonowens, J. Boeck and K. Brehm.

The Directors' report up to Dec. 31st, 1906, stated:

"The work of construction has proceeded satisfactorily and we may confidently expect to open the line within the contracted time. The rolling-stock has all arrived and is in use by the contractor. The last call has been made and share certificates issued."

The report was adopted.

The meeting then proceeded to consider an offer of amalgamation made to the Company by the Tachin Railway Co.

The Chairman said he hoped the meeting would accept the offer, which he considered a very good one. The amalgamation if agreed to would come into force on the date of the opening of the Meklong line. The construction of the line was so far advanced that he thought they would be able to open at the beginning of June, although really the contract time did not expire until August.

It was then moved and agreed to that the offers of the Tachin Co. be accepted, the basis of amalgamation being that every holder of 100 Meklong shares should receive 101 new shares, and for every 100 Tachin shares 125 new shares should be given in exchange.

The Chairman pointed out that the new shares could not be issued until the opening of the Meklong railway.

INTERIOR VIEW OF A MANGROVE SWAMP. THE LARGE TREE IS PAGATPAT. THE TREES WITH PROP ROOTS ARE BACAO *(Rhizophora conjugata)*.

UNION INSURANCE CO. OF CANTON

The thirty-fourth ordinary meeting of the Union Insurance Co. of Canton was held on April 13. The report states that the board has now to lay before the Shareholders a summary of the property and liabilities of the Society on the 31st December, 1906, and a statement of accounts to the same date. 1905 Account.—After payment of the interim dividend of $30 per share and the bonus of 20% to Contributors passed at the last annual meeting, there remains a balance of $385,290.64 as per annexed statement. The Board recommends that this sum be appropriated as follows:—A final dividend to shareholders of $12 per share on 10,000 shares $120,000.00. An addition to the Sterling Reserve Fund of £30,000 at exchange 2/3 3-16 $264,827.59 To be carried forward to Underwriting Suspense. Account to close the account for the year 1905 $450,463.05—$835,290.64.

The balance of Working Account on the 31st December, 1906, was $2,082,490.31.

The Board recommends that an interim dividend of $30 per share be paid to shareholders out of interest, absorbing $372,000, and that a bonus of 20% be paid to contributors, absorbing about $250,000, and that the remainder be carried forward.

All the 2,400 new shares have now been issued. The shares in the China Traders Insurance Company, Limited, acquired by the Society have been valued for the purpose of the balance sheet at $90 per share and the profit accruing on this valuation has been treated as premium on the new shares issued in exchange for them. The new shares rank *pari passu* with the old shares of the Society for the final dividend on 1905 account as well as for the interim dividend on

1906 account and the final dividend thus paid on these new shares will be charged against the premium on the new shares. After allowing for this final dividend the balance of the premium on the new shares amounts to $1,230,688.14 which sum the board has applied as follows:—Transferred to silver reserve fund $1,000,000.00. Transferred to investment fluctuation account $230,688.14.

SIBERIAN RAILROAD DURING THE WAR

The Russian official journal has recently published statistics of the traffic of the Siberian Railroad during the Japanese war. The railroad had been opened through to the Pacific at Dalny but a short time before the war broke out, and so was only beginning to have a through traffic, which, of course, was then entirely interrupted. It had had, however, an important immigration traffic, and on the western divisions a very considerable grain and dairy traffic.

The whole number of passengers in the three years ending with 1905 were:

Passengers:	1903.	1904.	1905.
First class	7,000	5,900	5,800
Second class	62,300	70,100	74.000
Third class	409,400	448,400	471,100
Fourth class	455,300	240,500	172,300
Immigrants	142,600	33,300	30.400
Stock attendants	2,800	2,200	1,800
Soldiers—1st, 2d and 3d class	101,700	939,100	1,077 900
Prisoners and their guards	100,100	18,200	13,100
Total	1,280,900	1,757,800	1,846,300

Thus the total number of passengers increased 37 per cent from 1903 to 1904 and 5 per cent from 1904 to 1905, but subtracting the military travel the number of other passengers decreased from 1,180,800 in 1903 to 818,700 in 1904 (30 per cent) and to 768,400 (7 per cent) in 1905. The through travel, largely first class, but always very small, came to an end with the war. Even in 1903 there had been only nineteen first-class passengers per day on this line of 4,000 miles. The second and third class passengers continued to increase, there being a movement of army attendants and surveyors largely exceeding what otherwise would have traveled west of Lake Baikal, but the fourth-class travel fell off 47 per cent from 1903 to 1904 and 28 per cent from 1904 to 1905. This travel is chiefly of laborers going from one place where work is to be had to another, in European Russia chiefly men employed in harvesting, who move north as the crops ripen. The reduction in the movement of prisoners, which seems frightfully large in 1903, was due largely to the cessation of banishment to the island of Saghalien, opposite the mouth of the Amoor.

The movement of troops naturally is the great feature of this period. No less than 939,000 soldiers were carried in 1904 and 1,178,000 in 1905. It must not be supposed that so great a number of different persons were carried. Aside from transfers from one place to another in Siberia, there is always a large movement from any army back toward the home of the soldiers, and in 1905 the larger movement must have been in carrying the bulk of the army back from Manchuria to Russia, which was chiefly but not wholly effected in that year. The movement of freight in this period increased greatly in most of the items which are reported, but these do not enable us to distinguish between what we may call the normal freight of the country and that due to the war. Of that carried by freight trains, the quantities, in tons, average as follows:

	Tons.		
	1903.	1904.	1905.
Military freight	4.892	406,179	583,470
Private freight	1,182,581	1,242,270	1.452,740
Service freight	1,751,808	1,938,280	,393,143

It is probable that in the aggregate the whole of the increase in what is here called "private freight" was due to the shipments of stores to be sold to the army, but the most notable fact in the statement is that the "service freight"—the supplies carried for the use of the railroad itself—exceed in amount the military and paying civil freight put together. Coal alone must have formed a very large part of this service freight.—*Railroad Gazette.*

DUTY ON MOTHER-OF-PEARL

The Board of United States General Appraisers on January 16 overruled a protest filed by Adolph Kastor & Bro., of New York, regarding the rate of duty on mother-of-pearl slabs cut or ground in various sizes and designs for use in the manufacture of handles for knives, button hooks and similar articles. Duty was exacted at the rate of 35 per cent under the provision in the tariff law for "manufactures of pearl." This return was objected to by the importers who set up a number of claims, among them being that the pearl should be deemed as not manufactured or advanced in value, and therefore free, or else that they be returned for duty at 10 per cent as enumerated unmanufactured articles, or else at 20 per cent as manufactured articles. The assessment at 35 per cent is affirmed.

The board sustained a claim filed by the Strauss-Samish Millinery Co., of St. Louis, it being held that the Custom House officers have no right to exact duty on samples of imported merchandise. The Collector is directed to reliquidate the entry,

AMERICAN ORIENTAL CONSULATES

Washington.—More than $1,000,000 for the purchase of proper quarters for American consulates in China, Japan and Corea is asked by Secretary Root in a communication sent to Congress to-day. The request is in line with the policy of the Secretary of State to make American consuls more respected and to establish them so they will be able to render better service in extending American trade.

The amounts Mr. Root asks Congress to appropriate are as follows: Amoy, $8,350; Canton, $115,000; Chefoo, $40,000; Chungking, $11,500; Foochow, $6,312 Hankow, $60,000; Hong Kong, $155,000; Nanking, $44,000; New Chwang $50,000; Shanghai, $241,000; Tien-Tsin, $65,000; Kobe, $120,000; Nagasaki, $55,000; Tamsui, $27,300; Yokohama, $104,493, and Seoul, $10,000, a total of $1,112,955.

"The conditions in China, Corea and Japan, in respect to securing suitable quarters for the offices and residences of the consular officers, differ greatly from the conditions prevailing in other parts of the world," said Mr. Root. "Buildings suitable for our purposes are not only few in number, but, on account of the needs of business men, are impossible to obtain except at a rental far in excess of that which this government is permitted to pay. At some posts consular officers have been obliged to pay considerable sums from their own pockets for rent, in order that the government might not be embarrassed in its business, or become an object of unfavorable comment. The situation has long been one of great annoyance to the government, and at times almost intolerable. It has been aggravated of late years because of the immense increase in the value of land and buildings, caused by the enterprise of commercial organizations and the action of other governments in securing large tracts of the most valuable desirable sections for their buildings."

MALAY MINING

Dealings have recently taken place on the Stock Exchange in the shares of Tekka, Limited, a company formed to acquire tin-bearing properties in the Kinta district of the Malay States, which is noted for the richness of its tin deposits. The capital is £90,000 in £1 shares, of which 70,000 shares have been issued, and the price paid for the property is £15,000 in cash and £15,000 in shares, leaving £40,000 as working capital. It is stated that for the issue of 55,000 shares the applications in Cornwall alone amounted to three times the number offered. As regards the prospects of the company, the report of Messrs. Osborne and Chappel, the well-known authorities on tin mining in the Malay States, gives the area of the property as 454 acres. It is proposed to work the deposits by hydraulicking in the same manner as is adopted by the Gopeng group of mines, the water to be obtained from the Raya River, under permission of the Government of Perak, by means of a ditch 3¾ miles long and a pipe-line of about five miles in length.

Owing to the fall of about 200 ft. between the river and the centre of the property, the company will be enabled to install an electric generating station of sufficient power to run two dredging pumps, by the use of which, together with the natural hydraulicking, the problem of dumping facilities is expected to be overcome and working costs reduced to a minimum. The physical features of the land are said to be favorable to the proposed method of working, and it is estimated that, on the basis of the treatment of 75,000 cubic yards per month, the life of the property will be at least twenty years, and the monthly profit about $15,750, or £22,050 per annum.—*Financial News.*

MOTOR CARS IN JAPAN

The proposed establishment of the Japan Automobile Company, with a capital of -Y-10,000,000 as a new scheme of public conveyance, is drawing a large amount of attention in Tokio. The popular nature of this enterprise may be inferred from the fact that no fewer than six different similar proposals have been promoted in the capital, while the Kwansai Railway Company is reported to have a scheme under contemplation to run motor carriages on its railway tracks. The six proposed companies in Tokio have now been amalgamated under the title of the Japan Automobile Company. The business will at first be confined to Tokio and neighborhood, and gradually extended to other parts. The first call on shares is to amount to -Y-2,500,000 and 200 automobiles will be bought. The first call amount to -Y-2,500,000.

BURMA TEAK TRADE

The output of the teak in the Burma forests during 1905-6 was 223,080 tons as against 218,466 tons in the preceding year. Of the total 86,702 tons were extracted by Government agency, an increase of 9,000 tons on the figures of the preceding year, and 136,378 tons by purchasers, a decline of 5,000 tons from the figures of the preceding year.

The total output is equal to the average of the last ten years. There is no reason to fear, says the Forest Report, that the output of teak will again fall except in particular years owing to bad floating seasons; on the contrary, it may be expected to increase.—*Siam Free Press.*

BURMA RICE FOR JAPAN

Large shipments of rice are now being made to Japan. There were in port on Sunday, says the *Rangoon Gazette* of the 25th ult., 34 vessels with a total tonnage of 77,940 tons registered. Of the 34 vessels 21 fly the British flag with a registered tonnage of 50,048 tons; eight German, 15,669 tons; and five Japanese, 12,223 tons.

Thirteen of the vessels were loading for Japan, which includes the five Japanese vessels referred to. The Japanese, it is said, intend sending as many as possible of their own vessels to Rangoon to take away all the rice they require.

PROSPECTS FOR RUBBER

The latest figures about rubber give the total output for 1906 at about 75,000 tons, valued at thirty millions sterling, says the *Bangkok Times*. That averages the price at about 3s 6d a pound. Of the total quantity, says a home paper, 64 per cent came

from tropical America, the home of the Para rubber tree. The whole of the plantation rubber that comes on the market does not make more than 2 per cent of the world's product. Many people are trying to invent a substitute, and many more are investing money in new plantations, but every year sees a greater demand, and it is estimated that in ten years' time the consumption will be double what it is to-day. The latest proposal is to use it for street paving, as rubber pavements have been found a success. In any case rubber planting provides an opening for investment in an industry where over-production is not to be feared, and it is to be hoped that the number of plantations in Siam will go on increasing.

SOUTH AFRICAN TRADE NOTES

The following items of commercial interest are published by the *British and South African Export Gazette.*

Last year ordinary cycles were exported from the United Kingdom to South Africa to the value of $700,000 and motor cycles to over $40,000.

Given favorable conditions in the money market the Cape government will shortly issue a large loan, chiefly for use in new railway construction.

A demand for looms in the Orange River Colony may be created if the scheme of Miss E. Hobhouse for teaching weaving to the Boer women proves a success.

There would appear to be a good market in South Africa for cheap stoves, fitted with ovens, to compete with the Swedish makes now almost monopolizing the market.

Kaffirs in many districts still winnow their corn by beating it with sticks and throwing it into the air. A simple corn sheller would doubtless sell well if properly introduced.

It is expected that the construction of the Congella wharf at Durban will induce timber firms to forward nine-tenths of their consignments through Durban instead of Delagoa Bay.

For the first time the British Board of Trade is offering a service of confidential information to British firms relative to their respective trades, and has opened a register for that purpose, reserving discretionary rights in regard to enrollment thereon.

The imports of boots and shoes into South Africa during 1906 are estimated at over $5,000,000; saddlery, $500,000, and other leather purchases about $400,000, all increases over 1905. Unmanufactured leather to the value of $750,000 was also purchased, chiefly from the United Kingdom.

During 1906 cotton piece goods were shipped from the United Kingdom to South Africa to the value of over $4,800,000, or $900,000 in excess of the amount for 1905. Dyed goods showed an increase of 28 per cent; printed goods, 25 per cent; unbleached goods, 24 per cent, and bleached goods, 9 per cent.

Motor cars to the value of nearly $300,000 were shipped from the United Kingdom to South Africa during 1906. It is noteworthy that a car on general touring lines is most suitable in such a district as the Rand, but for use on the veld, special features, such as extra strong springs and well-raised bodies, to provide for the negotiation of spruits, are essential.

The increased demand for Australian jams is to be noted, a result of the customs preference granted and the decline in the importation of chilled meat. Frozen butter, however, seems to be in greater favor, while the recent scare in regard to margarine, which is very largely used by hotels and restaurants for cooking purposes, has lost much of its force. Throughout South Africa a set is being made against the adulteration of foodstuffs.

NO FOREIGN TRAMWAYS OUTSIDE SHANGHAI SETTLEMENTS WITHOUT CONSENT OF CHINESE

A telegram to the *North China Daily News* announces that the Waiwupu has been notified by Viceroy Tuang Fang of the construction of electric tramways by British and French Companies outside the limits of the Settlements at Shanghai without the consent or knowledge of the Chinese authorities. The Viceroy states that although the Customs Taotai has applied twice to stop the work in Chinese territory until at least proper arrangements have been come to with the Chinese authorities, the reasonable request has been refused on the pretext that the building of the tramways will facilitate communications not only for foreigners but also for Chinese; also that as permission was given to a Belgian Company in 1902 to build electric tramways in the Chinese city of Tientsin, by Viceroy Yuan Shih-kai, similar permission might be given to foreign companies in Shanghai. The French- Consul General contends also that, as the Chinese authorities formerly allowed the French Municipal Council to build roads beyond Pahsienchao and Hsiachiao, the Customs Taotai has now no right to interfere; the power to grant the concession was vested in the Municipality, as the Taotai had not stipulated to the contrary when permission to make the road itself was granted. Viceroy Tuan Fang requests the Waiwupu to lose no time in bringing the question before the doyen of the Diplomatic Corps and the British and French Ministers. He adds that he has again instructed Taotai Jui to request the British and French Consuls at Shanghai to stop the work as speedily as possible, with a view to preserve the sovereign rights of China and to prevent the possibility of riots through the excited condition of the people at present. It is understood that by direction of Prince Ching, H. E. Tang Shao-yi has addressed the Diplomatic Body on the subject.

AUSTRALIA'S TRADE

Australia's trade returns for 1906 show a total of $572,985,115, an increase of nearly $97,500,000 over 1904. Her revenue for the last half of the year was $32,030,980, an increase of $2,408,230 over the corresponding half of 1905.

In December last the population of New South Wales was 1,530,940, being an increase for the year of 34,890. The excess of births was 25,895, and the excess of arrivals from abroad was 8,995. This is the largest increase since 1891.

New Zealand's exports and imports in 1906 amounted to $167,000,000, an increase over 1905 of $25,000,000, the largest yet recorded. The population increase was 29,500, also the largest of record. The net gain by excess of immigrants over emigrants was 12,848.—*New York Sun.*

PROSPEROUS CEYLON

There was never a time when trade in Ceylon showed such bright prospects. At a juncture when so much attention is being paid to rubber cultivation as the likely great, remunerative industry of the future, tea has once more forced itself to the front, and the absorbing topic in trade circles is the brilliant promise of the tea market. The remarkable increase in consumption of British grown tea—last year showed an increase of 23,000,000 lbs. in home consumption and exports to the colonies and foreign countries from England, while for the last four years the area of cultivation has been stationary—has created a very interesting situation. February will see the usual large crop of annual company meetings held in Colombo, and the change in the position since the shareholders last met will be startling. Last year the cry at nearly all low country company meetings was for the planting of rubber at all costs, even at the expense of the tea, and during the last few years hundreds of acres of tea have been interplanted with Para, which of course will gradually oust the older product where they have been thus intermingled. This year there will be a considerable modification in this demand. In the meantime while there has been no movement in rubber shares for a considerable time low country companies and tea-*cum*-rubber shares are experiencing a distinct boom. The situation is one which is not without elements of anxiety to upcountry tea-growers, who have only one string to their bow till the increased prices for common tea bring such a rush into the market as to at once blight whatever prospects there were of continued prosperity. There are, however, several factors which lead to the belief that high averages will be the order for a long period. During the reign of low prices great advance has been made in foreign countries, especially Russia and Germany, while advertising efforts of India and Ceylon have produced the desired results in the United States, and British-grown tea is going more freely into that country now than ever before. On the other hand there is no prospect of the production of tea in India and Ceylon increasing to any appreciable extent, while teas from Java used for blending are still strictly limited in quantity and China shows no sign of awakening, and the most cautious students of the market prophesy that production will not overtake consumption for a long time to come. Meanwhile nothing has occurred to, in any way, dim the bright prospective future of rubber. There is nothing in the rubber market which accounts for the present stagnation. Prices are high and there is nothing to show that they are likely to come down for many years. The probability is that the declaration of large dividends by some of the best companies in the near future will once more arouse attention and there will be a greatly increased demand for shares. No real public interest has yet been aroused in England in Ceylon shares, and it cannot be expected until a larger number of companies begin to pay returns. At present the great majority of these estates have not come into bearing.

Things are quite as prosperous, if not more so, with the next most important industry in the island. The extraordinary rise in the price of copra has given it a great impetus, but the period which the coconut palm takes to come into bearing prevents the laying out of capital to anything like the extent it has been laid out in rubber. For this very reason coconut estates are likely to continue to be extremely valuable property to those who are fortunate enough to be in possession of them already, because there is no danger of over-production. This is *par excellence* the industry of the natives, as those who have no intention to remain all their lives in Ceylon are not inclined to invest their money with the prospect of having to wait so long for a return. The plumbago trade, which is almost entirely confined to natives, is also doing well, so that the present remarkable wave of prosperity which is passing over the island is benefiting all sections of the community.—*Indo-European Commercial Intelligence.*

A MAMMOTH GERMAN LINER

The premier German shipping company has approved the plans for the construction of a vessel which shall exceed in size the *Kaiserin Auguste Victoria* and the *Amerika*, which now represent the latest developments in ocean travel. The new steamer will be called the *Europe* and will have a speed of 19 knots. She will carry 500 first-class, and 350 second-class, 1,000 third-class, and 2,350 steerage passengers; in all 4,250 passengers, so that with that for the crew there will probably be accommodation for 5,000 persons on board.

Among the conveniences for passengers will be a Ritz-Carlton restaurant, under the direction of the Hotel Ritz, Paris, which will be nearly twice as large as those on the *Amerika* and *Auguste Victoria*. A winter-garden and a sea-water swimming bath and Turkish baths will be provided. On the topmost deck a tennis court will be marked out.

The steamer is to enter the Hamburg-New York service and will make her maiden trip in the autumn of 1908.

She is to be built by Messrs. Harland and Wolff of Belfast.

THE NEW AMOY DOCK COMPANY, LTD.

The 15th Ordinary Yearly Meeting of Shareholders in this Company was held at the office of the General Manager at 11 a. m. on Saturday the 6th inst:—Mr. Fred. B. Marshall presided, other shareholders present being Messrs. W. Kruse, (consulting committee) B. Hempel, E. Thomas, Ed. H. Wallace, Robert W. Black (manager) & C. C. de Carvalho, secretary.

The secretary having read the notice convening the meeting,

The Chairman said: Gentlemen, the Report & Statement of Accounts having been in your hands for some days, I will with your permission take them as read. The net profits for the year's working, ending 31st December 1906, amount to $9379.56, to this sum must be added $1195.19 the balance brought forward from last account, which totals $10,574.75, and this sum it is proposed, subject to your approval, to deal with as follows:

Write off Amoy Dock	$731.16
" Plant & Machinery	$787.55
Commission & Fees to Manager	$937.96
Fees to Genl. Manager & Consulting Committee	$500.00

to pay a dividend of 50 cents per share absorbing $5000.00 and to carry forward the balance, $2618.88.

Gentlemen, I regret that we have not a more satisfactory showing for the past year's working to place before you, but work other than our regular harbor jobs, was scarce, and the disastrous typhoon that did so much damage to shipping in Hongkong in September last, did not supply us with any work. We were in hopes the Docks in the Colony would have had some overflow that might be diverted our way, and we took the necessary steps to secure any business offering; but without success. Still it is some satisfaction to report that even in a lean year such as we have just experienced, the Dock is able to pay its way and return a small dividend to Shareholders. The business we have had during the past twelve months can be looked upon as regular and likely to be continued from year to year, and probably increased as new oil tanks and other works now in process of building are completed, but to make a good year we must have one or two big jobs on steamers; these come in fits and starts, and cannot be relied on, but you will doubtless be pleased to know our Dock is so well equipped with up-to-date machinery, that we are always ready and capable of taking in hand any Docking and Engineering work that may be offered us.

During the past year we have spent some $4,368.48 on the Dock, most of this was for a new Working Shed which we found was badly required, more especially in wet weather. We had an unpleasant experience last year which gave your Manager and Consulting Committee considerable worry and trouble, but I am pleased to say terminated favorably for the Dock. The owners of the steam launch *Wo On* sued the Dock in the British Consular Court for some $18,000.00 odd for supposed damage done to their boat and for which they wished to hold us responsible. I need not here say more than that with the assistance of our Hongkong Lawyers we defended the case, and came through without any expense to the Dock. We have now a claim against the owners for some $5000.00 odd, but as this was to go through the Chinese Court it takes time and trouble. The British Consul is supporting our demands and we have every reason to expect our claim will eventually be met in full

I may here mention, Gentlemen, one of our greatest troubles is to collect accounts due us; if we could do so on due dates we should have little or no overdraft with our Bankers, and during the past few years interest has been quite an item in our accounts which we would like to see reduced, but many of our customers find times hard, and owing to competition, and to keep the business together, we have to allow some little slackness in settling of accounts.

You will notice, Gentlemen, your Consulting Committee and General Manager have again waived a very large percentage of their Fees, but I hope the day is not far distant when the Dock will again be having good years, and full fees can be withdrawn by your Consulting Committee and General Manager without making an appreciable tax on your profits. As my business will not permit of my being here during the summer months, your Consulting Committee have asked my Firm (Messrs. Tait & Co.) to act as General Managers. This, Gentlemen, will enable cheque book, accounts, etc., to be kept in one office for the year, instead of, as sometimes has been the case, changing more than once during the twelve months.

Gentlemen, there are no other points which occur to me to refer to, but any questions you may desire to put bearing upon the statements now before the meeting, I shall be glad to answer to the best of my ability.

—No questions being asked

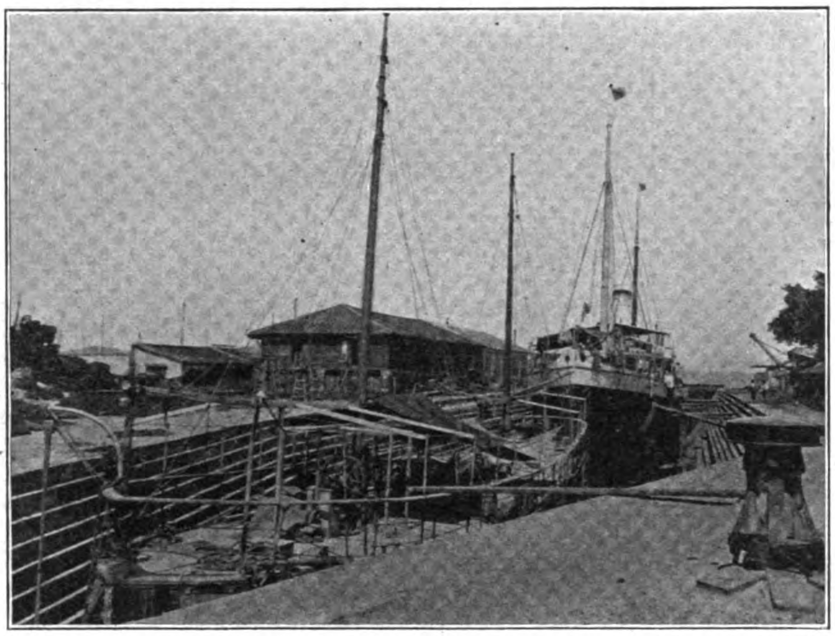
The Chairman proposed that the Report and accounts as presented be adopted and passed.

Mr. Thomas seconded and the motion was carried unanimously.

Mr. Black then proposed and Mr. Hempel seconded the re-election of Messrs. Gardnier & Kruse,—carried unanimously.

The Chairman—This is all the business. Dividend Warrants will be ready on Monday.

A vote of thanks to the Chairman, proposed by Mr. Thomas and seconded by Mr. Hempel, terminated the meeting.



GRANITE DOCK—THE NEW AMOY DOCK COMPANY, LIMITED, AMOY, CHINA

BENGAL TELEPHONE CO., LTD.

REPORT.—The directors beg to submit to the shareholders a statement of accounts for the year ended 31st December, 1906.

The revenue account shows a balance to credit of Rs. 61,445-10-6, which has been transferred to profit and loss. Including Rs. 12,578-14-10 brought forward from 1905, the amount available for disposal is Rs. 69,646-15-4.

It is proposed to deal with that sum as follows: To pay a dividend of 5 per cent. which will absorb Rs. 44,000 and to carry forward Rs. 25,646-15-4.

BOMBAY TRAMWAYS

The Bombay administration Blue-Book for 1905-06 reports Bombay City, Karachi and Nasik as the only places possessing tramway services in the Western Presidency. The Bombay Tramways have a length of track of 17 miles and carried 25,119,426 passengers during the year under notice; the Karachi Tramways with a track of 7 miles carried 2,549,518 passengers; while the Nasik Tramway carried 102,266 passengers. Of new tramway extensions, the Neral-Matheran Steam Tramway was almost completed during the year; a proposal to construct a steam tramway or light railway on the Nadiad-Kapadvanj Road was under contemplation; another scheme to connect Dhanduka with the Bhavnagar-Gondal-Junagad-Porbundar Railway at Ranpur by means of a steam tramway was also under consideration; and finally the prospects of a tramway service in Broach are also reported as being under investigation.

CENSUS OF CHINESE PROVINCES

The following is an authentic census of some of the Chinese provinces compiled by the Board of Finance.

Fengtien 5,406,359, Jehol 665,768, Kirin 1,132,132, Shangtung 37,952,823, Shanhsi 11,361,843, Honan 23,134,124, Shenhsi 8,702,820, Chekiang 11,997,950, Kiangsi 24,650,157, Hupeh 31,310,431, Hunan 3,126,513, Szechuan 77,430,981, Kuangton 30,355,502, Kueichou 4,899,085, and Kiangnan 23,220,687.

From the above it will be seen that the province of Szechuan alone contains a population about twice that of Japan and France, and 50 per cent. greater than that of Germany, and about the same as that of the United States of America.

Mines, Mining and Minerals in the Philippine Islands

(Edited by the Bureau of Science, Manila)

[*This department will be a regular feature of* THE FAR EASTERN REVIEW *and will prove of general interest and value, especially to the miners of the Philippine Islands. It will contain a variety of reliable articles, observations and notes concerning the minerals of the archipelago, their development, observations on the mining situation, reports on the progress of development work by private interests, notes of a personal nature dealing with the movements and doings of the miners, and a fund of other useful information all of which is expected in a small way at least to help along mining enterprise. In order to give special weight to the department, as regards accuracy, etc., we have arranged with the Director of the Bureau of Science to have the matter edited by the Chief of the Division of Mines.*—EDITOR'S NOTE.]

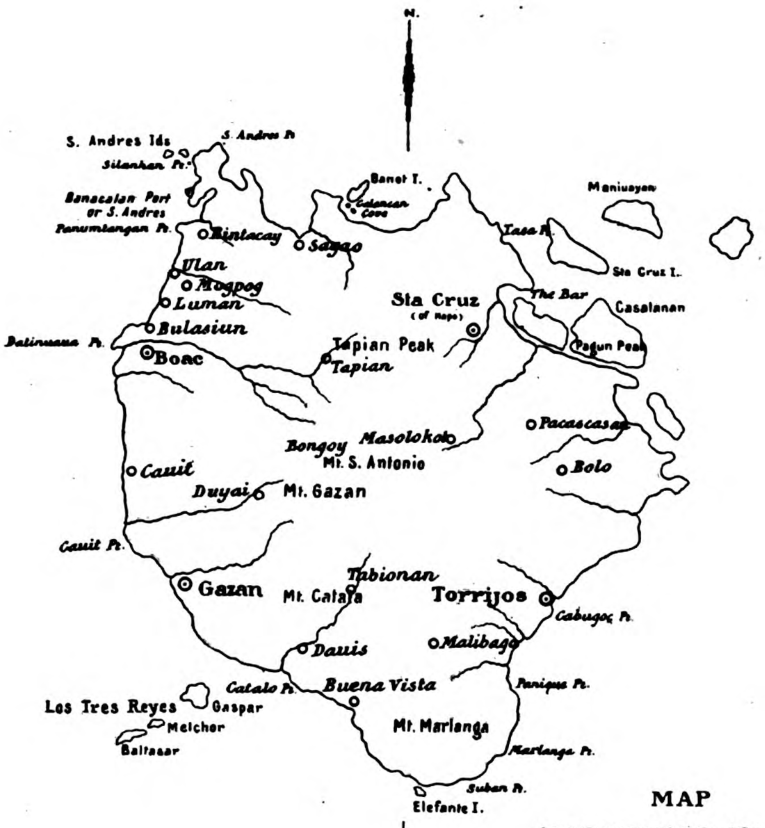
ISLAND OF MARINDUQUE

The island of Marinduque is built upon a foundation of igneous rocks, chiefly diorite (in some places quartz diorite) and andesite It is quite possible that the latter is but a superficial phase of the former, its porphyritic texture being due to the more rapid cooling of the igneous mass. These basal rocks were covered with a series of sedimentaries, of which a very siliceous white sandstone was the most important member. The period of sedimentation was probably followed by one of eruptive activity, which produced a blanket deposit of tuff and andesite, and this was in its turn submerged to be covered with a capping of white limestone. Then came the final elevating thrust, which being applied either unequally or to an unequally yielding mass, caused a prevailing dip of the overlying strata southwards.

The eruptive period in the island's history witnessed not only a considerable change in the topography but also a marked alteration and metamorphism of the earlier rocks. The white sandstone became a fine grained white quartzite, while the igneous rock suffered a change both in composition and in structure. In some places, notably in the southwestern part of the island, are found immense serpentine and chloritic outcrops which resulted from the alteration of the more basic igneous rocks. These rocks have in places become so squeezed and shattered as a result of metamorphic processes, as to cause them to take on a fine felsitic texture, and to develop a marked cleavage structure. Numerous fissures were also opened during this period, to become filled in time from quartz and ore bearing solutions. One of these is about seven miles east of Boac on the bank of the Malaquing Sapa, in the barrio of Tappiing. Here a fifteen inch fissure vein of slightly auriferous quartz occurs between igneous walls, one of which is the dark felsite very much fractured and the other a quartz diorite containing considerable pyrite.

From the direction of the fissures and the strike of the folded strata, it seems likely that the direction of the dynamic stresses was approximately N. N. E. and S. S. W. The fissure veins in igneous rocks show no remarkable uniformity in strike and were probably first caused by contraction of the molten mass to be later modified by rock movements.

About half a mile southeast of the barrio of Bintacay, in the extreme northwestern part of the island, is an outcrop of very much weathered andesite, in the cut of a new wagon road. Running through it at various angles



MAP

MARINDUQUE ISLAND

COMPILED FROM FIELD NOTES AND VARIOUS OTHER SOURCES

MAURICE GOODMAN
ASST DIVISION OF MINES
BUREAU OF SCIENCE

MARCH 1907

are numerous small stringers of quartz, the two largest of which carry a small amount of specular hematite, about 2½% of copper and traces of gold. The dip is almost vertical and the general direction of the veinlets here appears to be approximately E and W. Although happily situated with respect to harbor and transportation facilities, the veins are too small and too poor to make them of economic value.

About three-fourths of a mile W. N. W. of the barrio of Masolokot, intersecting the Pansui creek, which here runs almost due East, is an outcrop of a quartz lode. On the north side of the creek is a hard quartz vein, ten to twelve feet wide, running approximately N. N. W. and S. S. E. and dipping about 35° towards the W. S. W. The outcrop has been exposed by erosion for a length of about fifty feet, but scarcely any development work has been done upon it by the locators. The country rock which is an andesite, is largely fractured, the main cleavage plane being roughly parallel to the plane of the vein. The contact is quite distinct but irregular, and large horses of the country rock are enclosed in the vein itself. Stringers or lenses of galena also appear in the matrix, most of them being quite small both in length and in width. The largest, which consists of practically pure galena and a very small amount of iron pyrites, has been followed for a length of about twelve feet, in which distance it has widened out from about two inches to ten inches. The chute appears to be lenticular in form, dipping downward along the strike as well as lying parallel to the vein itself. The vein is very irregular in mineralization, and a number of samples taken from different portions of the vein show it also to be surprisingly poor in gold and silver values. A sample from the center of the vein, which proved to be the richest portion, gave only 0.01 ozs. of gold and 1.25 ozs. of silver per ton; equivalent in value to about $1.08. It is evident, therefore, that the entire vein could not be worked at a profit, and the only question remains as to whether or not there is a sufficient amount of galena in the vein to pay for working the richer streaks and then hand-sorting the ore. The galena carries no gold and but 11.38 ozs. of silver per ton, which is worth about $7.85 at the present high market rate. The cost of mining would be high, for the quartz is hard and flinty and the rich seams are apparently very irregular and probably not continuous. Pumping also would probably be an important item. The present prospect is a hole but about four feet deep and almost on the level of the creek which intersects the vein. Transportation would be expensive, for there is no road from the location to the coast, which is about five miles distant in a straight line and considerably farther, along the banks of the Pansui creek. Such a road would also be expensive on account of the heavy cutting which would have to be done, and bridges that would be required.

From the present showing therefore it would seem that the exploitation of this vein would prove an unprofitable undertaking. It must be remembered, however, that the ground has been prospected but to an extremely small extent and that further exploration may alter the case materially by showing up larger and more continuous chutes. However, profitable lead mines in igneous rocks are rather uncommon, and considering the conditions, it is not very likely that this will be one of the exceptions.

On the south side of the river the lode is split into two branches, making an angle of nearly 180° with each other. The larger of these is about five feet wide and strikes approximately E. S. E. and W. N. W. dipping about 42° towards the S. S. W. The lower half of this vein is a hard quartz, projects more prominently and above the hanging half and shows a marked slickenside, indicating a movement within the vein itself. The assays were extremely poor, showing less than 0.2% of lead, a trace of gold and no silver.

Near the barrio of Bolo, a lode similar to the one described above outcrops at a place locally known as Putul na Bunduc. The Bolo creek has denuded the face of the vein, exposing it to a height of about thirty feet and for a length of about 150 feet. The vein is fifteen to twenty feet thick and strikes N. N. E. and S. S. W. with a dip of 72° towards the W. N. W. The location is far more suitable for the purpose of mining than the one previously described, but unfortunately, the value of the ore is very small. A rough sample of the outcrop showed 2.07% lead and 0.02 ozs. gold, giving a total value of only $2.85 per ton at the present market rate of lead.

A much more promising prospect exists near the barrio of Pacascasan. Here a claim has been located and staked on a quartz vein, which at the time of my visit was entirely undeveloped, with the exception of a very small open cut across the vein and about four feet deep. This exposed a five foot vein of red clay and both honeycombed and crystallized quartz, containing a small amount of galena and pyrite. Free gold was also observed in the quartz but in very small amount. From the small area uncovered and from other outcrops, the strike of the vein appears to be N. W. and S. E. with a slight dip towards the S. W., but other outcrops near the discovery line make it appear as though there are either more than one vein or else that these outcrops belong to offshoots from the original vein. Both walls of the vein are andesite, which has been very much kaolinized and stained at the contact, making the line of demarcation indistinct. An average assay of two samples taken across the vein in the open cut showed 0.64% lead, 0.55 ozs. gold, and 0.305 ozs. silver per ton, or a total value of $12.33 at the present market rate of metals. It should be remembered that these samples represented but a very small area, and their importance should therefore be estimated accordingly; nevertheless the prospect must be conceded promising.

The location of the prospect is admirably adapted for economic operation. It is about 550 feet above sea level, in a small draw, and about 120 feet below the top of a ridge. This ridge is fairly steep and terminates in a coastal plain about one and a half miles wide. The coast and what appears to be a well protected port is only about two and a half miles distant and in plain view.

In addition to the several lodes described above, it is interesting and may prove of value to some, to report that in the Napó River, only about 300 yards south of the municipality of Santa Cruz, were found a number of large and almost pure specimens of galena and chalcocite float. While no one specimen contained both minerals, it is quite possible that they were derived from, and constituted separate stringers in the same vein. Some of the boulders which contained both quartz and chalcocite weighed about 250 pounds and were nearly two feet in diameter. One of these specimens showed roughly 18% copper, 0.2 ounces gold, and 8.0 ounces silver per ton. A rounded boulder weighing about ten pounds consisted of practically pure galena and carried 0.04 ounces gold and 6.85 ounces silver per ton. Unfortunately, the lode from which these specimens were derived could not be readily located, and it was impracticable to institute extensive explorations for that purpose, but it is almost certain to prove a valuable find to the prospector who is successful in doing so. Nor should it prove a very difficult matter, for to judge from the carrying power of the stream, and the size and weight of the specimens, the source cannot be far distant. Another suggestive clue is the fact that the float was found in a low river bank, the base of which is igneous while the hill immediately above it is the hard white quartzite. It is therefore quite possible that the lode, like the float, will be found at the contact between the two formations, this being a line of weakness and a likely place for the formation of a vein.

Only one other mineral deposit was encountered of sufficient extent to be worth recording. This is a deposit of specular hematite which outcrops in the gorge of the Maculapnit Sapa, a branch of the Boac River. The deposit is about twenty feet thick and dips at an angle of 22° towards the S. E. It lies upon a floor of altered sandstone containing olivine, hematite and secondary quartz, and is capped by a stratum of hard, greenish, impure quartzite, very much fractured and containing considerable pyrite. The extent of the deposit could not be definitely determined on account of the soil and vegetation which covered the ground, but to a height of 100 feet above the river, the ore could be easily traced. While there may be no objection to it on the score of quantity the matters of quality and accessibility are less satisfactory. An analysis of a sample taken from the outcrop showed the following percentages: Fe 56.88, Si O_2 13.91, S 0.79, P trace. The high percentage of sulphur is almost prohibitive, but this objection may be partly overcome by sorting, for the pyrite is not uniformly distributed through the ore, but occurs more or less in bunches.

The chief drawback to this deposit is its relative inaccessibility. It is situated about ten miles east of Boac, and is connected with it partly by a fair road which crosses and recrosses the Boac river and its branches at numerous points. The last two or three miles, however, are impassable to large animals, being over a very narrow and rocky trail, partly on the banks and partly in the river itself. Timber in the neighborbood of the deposit is plentiful, so that there would be plenty of material for charcoal making, should anyone consider starting a small iron industry similar to that of the Angat region.

In addition to mineral deposits, there are several deposits of bat guano distributed over the island of Marinduque. As in other parts of the Philippines, they are located in caves of the limestone capping. One of the largest of these is located at an elevation of about 1400 feet above sea level, in a place called Bongoy, about three miles N.N.E. of the barrio of Duyai. This barrio is connected with the coast by a fairly good road, but from Duyai to the cave, the ascent is very steep and difficult. The mouth of the cave is very wide and high and its sides and roof are hung with large vari-colored stalactites. The entrance is down a steep and rocky path to the cave proper, which is about fifty feet below. The main chamber is about 120 feet long by about 35 feet wide, and branching from it are three smaller chambers. The floors of all the chambers are covered with bat guano, which is wet and muddy at the center, but dry at the sides and ends. The average of a number of soundings showed but two feet of depth. It is estimated that there are about 400 tons of guano in this one cave.

Another occurrence of geological interest rather than economic importance, was observed about two and a half miles up the stream from the barrio of Tabionan. Here a small flow of natural gas is emitted from a minute fissure in a metamorphosed igneous rock, composed largely of serpentine. This formation overlies a series of sedimentaries consisting mainly of impure limestones, and these latter are probably the source of the natural gas. Several other small gas leaks were noticed, some on the bottom of the stream and some on the banks, but all issued at a very low pressure. The largest of them afforded a flame but seven inches high.

In conclusion, it were well to caution whoever may be interested, that these notes are the results of observations extending for a period of less than a month over an island of approximately 350 square miles. The work was therefore in the nature of a rapid reconnoissance, and the geological inferences drawn as the result of hasty observations, must therefore be left subject to modification, should a more detailed study render it necessary. However, these notes may not be entirely without value to future prospectors, and even to the geologist these brief notes on an island, which has to the writer's knowledge no other geological literature, may perhaps be of some interest.

MAURICE GOODMAN.

PERSONAL

Mr. Leonard Lehlbach, manager of the Lepanto Mining Co., sailed from Manila on the *China* last month for San Francisco. He expects to spend some time in the United States in the interests of his company.

The Kimball brothers, who are managing and superintending the dredge in Masbate, have been spending a couple of weeks in Manila on business.

Mr. M. P. Boag of the Risdon Iron Works, who recently arrived in the islands, brought with him a stamp mill and concentrating machinery which he will install on the Eastern Gold Bug Mining Co.'s property in Masbate.

Mr. G. R. Fearby, the first discoverer of a deposit of tin in Australia, paid a short visit to the Philippines recently. At present he is in Indo-China and reports having located some good tin ore in that province.

Mr. Nightingale of the Federated Malay States Inspectorate of Mines passed through Manila last week on his way to the China Coast.

Manager Eye of the Clarke's Consolidated mines at Antimok, Benguet, was a visitor to Manila last month. He came to meet his wife who arrived from the homeland.

Mr. Dilworth, who was associated with Mr. Lyman in the investigations of the Cebu coal-fields, has gone to Polillo in the interests of the same company. Mr. Lyman sailed from the Philippines last week fully recovered from his serious illness.

George Morgan, vice-president and secretary of the Eastern Mining Company of Masbate, leaves on the *Shawmut* for the United States on business connected with his company.

TRADE OPPORTUNITIES

Gasoline engines.—H. J. Reesink & Co., Havenstraat, Zutphen, Holland, write to the Manufacturers' Record: "We are in the market for first-class gas, gasoline oil, or benzine engines."

Telephone material.—The Postmaster-General of Western Australia, at Perth, invites bids until March 25 for lead covered, paper-insulated telephone cable, as follows: Two miles of 208 pairs (20-pound conductors); 110 yards of 156 pairs (20-pound conductors); 660 yards of 104 pairs (20-pound conductors); and 880 yards of 52 pairs (20-pound conductors). Deposit 5 per cent up to $5,000 and 2½ per cent on any further amount in excess of $5,000, The Postmaster-General of New South Wales at Sydney, invites bids until April 29 for telephone material, including registers, relays. wire attachments, keys, etc. The Public Works Department of the Alberta Government, Canada, are making arrangements for the construction of a telephone line between Edmonton and Lloydminster, Alta. Another line will also be constructed from Edmonton to Athabasca Landing, Alta.

Bridges and supplies.—The city corporation of Auckland, New Zealand, invites bids until May 9 for the erection of road-traffic bridge 36 feet wide, 810 feet long, from center to center of abutment (reenforced concrete or steel), 95 feet solid earth filling, held up by retaining walls, total length 910 feet; $500 premium for best design not adopted. Address the town clerk. The city corporation of Dunedin, New Zealand, asks for bids until June 19 to supply (1) ironwork to furnish complete six beds of horizontal through retorts; (2) fire-brick goods and retorts for same; (3) stage floor consisting of cast-iron columns, steel girders, and floor plates; (4) steel roof principals; (5) cast-iron gutterings, down pipes, etc.; (6) gas holder. Address T. Cole, 11 Victoria street, Westminster, S. W., London, England. Tenders are invited for the construction of an iron bridge at Oued Damous (Algeria). Apply M. Gauckler, 19 boulevard Bon Accueil, Alger-Mustapha.

Railway construction.—Vice-Consul S. K. Lupton of Valparaiso, reports as follows: The Government of Chile has completed its railway development scheme, and Congress has authorized the President of the Republic to build and contract to build railroads to cost nearly $40,000,000 gold. At least 1,814 kilometers (kilometer, .62137 of a mile) of this is to be built with capital provided by the builder, who will be allowed to operate the road until it is paid for by the Government. It is said that the limit fixed for the average cost of the line is $17,000 per kilometer, not counting rolling stock.

Public works.—The *China Telegraph* states that liberal provision has again been made this year for works in connection with the development of the State of Pahang, Malay Peninsula, the Public Works Department being allotted more money to spend in 1907 than ever before. The total amount voted for works, buildings, roads, and bridges is $825,821, against $607,700 in 1906, or an increase of $218,121. If to this be added the sum of $72,749, provided for "personal emoluments" and "other charges," the total will be $898,570. Under the heading of works and buildings $177,975 is provided, of which $23,600 is classed as annually recurrent expenditure, and the balance $154,375 is for special services. Under this latter head $41,500 is provided for a much-needed water supply for Bentong, a thriving mining center; $30,000 for a new Astana for his Highness the Sultan at Pekan, and $10,000 for town drainage at Bentong. One of the most important votes is a first installment of $50,000 for the Benta-Sepan section of the main trunk road from the Ulu to the east coast. The proposal is to make a cart road from Benta, a point on the Pahang trunk road 16 miles from Lipis to Kauntan. It will be a great undertaking in road making, the distance being estimated at about 150 miles. The line of this road will pass through some of the richest agricultural and mining lands in Pahang, and it will be of incalculable value in opening up the State.

Railway materials.—According to the official advices received by the Department of State, the South Manchuria Railway Company, which is under the direction of the Japanese Government, has decided to adopt the American system, and to place large orders for materials in the United States as an expression of appreciation of America's friennly attitude toward Japan.

NEW PUBLICATIONS

Henley's Twentieth Century Book of Recipes, Formulas and Processes—Edited by Gardner D. Hiscox, M. E. A book suited to the needs of everyday life and contains selected recipes and formulas for producing compounds that every one must need at some time. The Norman W. Henley Publishing Co., 132 Nassau Street, New York, U. S. A. Cloth $3.00; Three-quarter French Morocco, $4.00.

Distillation of Alcohol and Denaturing, by F. B. Wright. Devoted particularly to the processes of distilling from farm products and the denaturing of the alcohol product for use in farm engines, etc. Spon & Chamberlain, 123 Liberty street, New York. Price $1.00 net.

The Six Chord Spiral, by J. R. Stephens, M. E. A demonstration in technical form of the advantages of the Six-chord spiral for practical use in surveying. The Engineering News Publishing Company, New York. Price, cloth $1.25; boards, $1.00.

The Directory and Chronicle for China, Japan, Korea, Indo-China, Straits Settlements, Malay States, Siam, Netherlands India, Borneo, The Philippines, etc. for 1907, forty-fifth year, by the Hongkong Daily Press Publishing Co. Des Voeux Road, Hongkong. Price, Thirty Shillings

HEMP STATISTICS, MARCH 1st, 1907

(Courtesy of C. N. Nicholson, *Secretary Manila Chamber of Commerce.)*

Arrivals of hemp at Manila up to 30 March		174,437 *Bales.*
Arrivals of hemp at Cebu up to 30 March		47,803 *Bales.*
Arrivals of hemp at all Ports up to 30 March		222,240 *Bales.*
Stocks on hand in Manila and Cebu on 1st January 1907		63,432 *Bales.*
Total		285,672 *Bales.*
Export to all parts to date 30-3-07	181,824 *Bales.*	
Local consumption estimated at	1,200 "	183,024 *Bales.*
Total stocks at Manila and Cebu on 1st April 1907		102,648 *Bales.*

EXPORT OF HEMP, MARCH 1907.

Date	*Vessel*	*London*	*L'pool*	*Atlantic U. S.*	*Pacific East & California*	*Australia*	*Other pts.*	*Total Bales*
	F'wd:—	48,960	15,093	32,496	3,000	480	8,605	108,634
Mar. 1	Hongkong Maru						200	200
" "	Rubi	1,100					700	1,800
" "	Loongsang	155	100				416	671
" "	Schuykill, Cebu			8,980				8,980
" 3	Indrasamha			18,545				18,545
" 5	Prinz Waldemar					100		100
" 6	Taming						921	921
" 7	Sandakan						100	100
" "	Zafiro	17					554	571
" "	Antilochus, Cebu	5,921	1,463					7,384
" 11	Tsinan					50		50
" 13	Changsha						470	470
" 15	Yawata Maru						50	50
" "	Rubi	1,026					350	1,376
" 18	Isla de Panay	1,950	250				50	2,250
" 19	Taming						200	200
" 21	Chingtu						661	661
" 22	Zafiro						100	100
" 25	Kumano Maru					1,085		1,085
" 29	Yuensang						300	300
" "	Palma	14,471	3,680				1,200	19,351
" "	Empire						626	626
" "	Indrapura, Cebu			7,375				7,375
" "	Foxley "						24	24
Total		73,600	20,586	67,396	3,000	1,715	15,527	181,284

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

TRAMWAY FOR NAGASAKI.—Application has been made to the Minister of Communications, reports the *Nagasaki Press*, for permission to construct an electric tramway in Nagasaki. The main line would connect Urakami and Oura and a branch line would run round to Inasa. The promoters belong to Nagasaki and the capital required is estimated at Yen 1,200,000.

ELECTRIC RAILWAY STATISTICS.—Statistics covering the electric railways of the United States at the end of 1905 indicate that the trackage aggregated 32,517 miles (including elevated railway), with 63,391 motor cars and 13,059 trail and service cars. Cable, steam dummy and horse lines aggregate only 633 miles, with 1,084 grip cars or locomotives and 2,217 trail or horse cars. The total capital stock was $1,844,565,136.

NEW WAVE MOTOR.—At Young's Pier, Atlantic City, a new wave motor is lighting a portion of the pier, notes *The Western Electrician* (Chicago, February 9). It is the first really successful contrivance of the kind in use. "It is a big float or buoy and so arranged that the motion of the swells will work it, no matter at what angle the waves run. This motor drives a compressed-air engine, which fills large tanks. The tanks in turn feed a compressed-air motor, which drives the dynamo that furnishes the current for the lighting."

MONSTER WHISTLE.—A whistle that can be heard normally at ten miles, and at twenty with a strong wind, has been installed by the East St. Louis and Suburban Electric Railway Company at the power house, where the company's machine shops and car barns are located. The greatest modern siren comprises three whistles. The largest is almost six feet in height and nearly as big around as a man. On each side of the main one is a smaller whistle. This big triple whistler is connected with an electric clock, regulated by the Government standard time sent out from Washington. The electric lock with the whistle is guaranteed not to vary five seconds in time a year.

ELECTRIC LIGHT DONT'S.—The following "Electric Light Dont's" are contributed by Ernest Filer to *The Daily News*, Chicago: "Don't let the office boy or any one else who does not understand make changes in electric wiring or lights. They may do the very thing they ought not. Don't pull a lamp hung by a flexible cord to one side with a wire and then fasten to a gas-pipe. I have seen a wire become red hot in this manner. If the lamp hung by a cord must be pulled over, use a string. Don't wrap paper around a lamp for a shade. You might go home and forget it and a fire might be started from the heat. Use a glass or metal shade. That is what they are for. Don't let a socket on a fixture hang loose. Have it repaired. Otherwise it may cause trouble where least expected. Don't try to save a little by running flexible wires over boxes, partitions, and into closets. Have permanent wires installed. These flexible wires used this way are dangerous."

ELECTRIC EXTENSIONS AT YOKOHAMA.—An investigation committee of the Yokohama City Assembly met on March 11 to discuss the petition of the Yokohama Electric Railway Company for leave to extend its line from Nishinohashi to Hanazakicho, via Kurumabashi, Chojamachi and Hinodecho; another from Nakamuracho to Honmoku, via Ishikawa, Motomachi and Daikanzaka, and another from the front of Messrs. Jardine, Matheson & Co., to Kamakura and Negishi via Bund, and Honmoku. It was decided at the committee meeting to make a survey of the places named.

Messrs. K. Inouye, G. Usui, M. Tsuchida, M. Yokoyama, Y. Hagino and others have promoted the establishment of a new electric tramway company for Yokohama with 1½ million yen capital under the style of the Yokohama Shigai Denki Tetsudo Kabushiki Kaisha. Application for official permission has already been made to the authorities. The company proposes to lay a line from Kamenohashi to Aokimachi via Matsukahehcodori, Hanazakicho and Hiranumamachi; another line from Midoribashi to Kamenohashi via Nogemachi, Hinodecho, Suyeyoshicho, Minami-Yoshidamachi, Miyoshicho and Nakamura-machi, and another line from Aokimachi to Hodogoya via Sengenhsita.—*Japan Advertiser.*

RAILWAYS AND RAILWAY SUPPLIES

SHANTUNG RAILWAYS.—H. E. Yang Shih-hsiang, Governor of Shantung, has approved an application by the Kiaochow-Chinan-fu Railway Co., for permission to construct a railway from Yih-hsien to Tien Chwang-ho, which will be a branch of the Company's main line.

CHENGLING TAIYUANFU RAILWAY.—As an enormous sum was required to buy back for the Peking-Hankow Railway, the Chinese Government is now considering instead the redemption of the Chengling Taiyuenfu Railway, which has been built partly by Russian capital.

REDEMPTION OF PEKING-HANKOW RAILWAY.—A dispatch from Peking states that the board of communications held a conference there recently on the subject of redemption of the Peking-Hankow Railway and had come to a decision as to the question of management.

PROPOSED RAILROAD AT YANGCHOW.—A score of wealthy salt-merchants in Yangchow are interesting themselves in a project to construct a railway from Icheng to Taschow, principally for the transport of salt. These merchants have subscribed two million taels for the enterprise, and have appointed Their Excellencies Lin Men and Chu Yu-chi to manage it.

TRANS-SIBERIAN RAILWAY.—The service on the Trans-Siberian Railway has been increased to three express trains a week from Vladivostok to Moscow and three from Moscow to Vladivostok. Trains arrive in Vladivostok from Moscow on Tuesdays, Wednesdays and Fridays at 11:45 a.m. The trains arriving on Wednesdays and leaving on Fridays belong to the International Sleeping Car Co.

ANAM-YUNNAN RAILWAY COMPANY OBSTRUCTED.—The French minister at Peking has filed a protest with the Wai-wu-pu in which he asks for protection against the tribes of the township of Mangu, Yunnan province, who have repeatedly obstructed the construction. French troops are reported to have been distributed among the different railway stations in Yunnan awaiting some definite action by the viceroy.

SHANGHAI-NANKING RAILWAY.—According to a coast exchange the Shanghai-Nanking Railway will open the line between Wusieh and Changchow for passenger traffic about May first. The company has ordered 10,000 tons of steel rails from the Hanyang Iron and Steel Works for immediate delivery. The line from Wusieh to Changchow was announced early in the month as open for the carrying of freight April 10.

HEILUNGCHIANG RAILWAYS.—H. E. Chun Teh-chuan, Tartar-General of Heilungchiang, has informed the Central Government that the gentry of that province have subscribed Tls. 2,000,000 towards the cost of the proposed Tsitsihar-Aigun railway. The first section, as far as An-chang has been surveyed and a great quantity of material has already been provided. The sleepers will be supplied by the Province and the rails will be obtained from the Hangyang Ironworks.

KIRIN-CHANGCHUN RAILWAY.—The governor of Kirin opposes the proposition made by the Russians and the Japanese that the Kirin-Changchung line be built by capital contributed jointly by Russian, Chinese and Japanese capitalists and has requested the Wai-wu-pu to persuade the Russian and Japanese governments to withdraw their request. This indicates that the Chinese are anxious to build the road with Chinese capital and develop Kirin without outside help.

DOUBLING TOKAIDO RAILWAY.—The work of doubling the Tokaido railway is progressing. The section between Kiyosu and Kisogawa, a distance of 9 miles 6 chains, was doubled on March 1, while the section between Nagoya and Biwajima, a distance of 2½ miles, and also that between Ofu and Otaka, a distance of 4 miles, will be completely doubled by the end of this month. The section between Otaka and Atsuta, a distance of 4 miles, will be doubled in May.—*Japan Advertiser.*

MONGOLIA RAILWAYS.—Peking advices state that although there has been a long discussion in the Grand Council respecting the proposal to construct a railway from Kalgan to Kulun, in Mongolia, the project has not yet been sanctioned. H. E. Councillor Ling Shao-nien has been urgently recommending the plan to their Majesties, who, it is said, on the advice of H. E. Tang Shaoyi, are prepared to approve it. The work will probably be undertaken after the completion of the Peking-Kalgan line.

BIG ORDER FOR CARS.—The purchasing agent of the Pennsylvania Railroad has invited bids for the construction of 5,000 cars. Their estimated cost is $6,000,000. With the placing of this order, the company will have ordered within the last two years nearly 60,000 additional freight cars of various types. It is also said that the company is getting better service out of its cars than ever before. The average movement of its cars per day in 1904 was 16.52 miles, while for 1906 the average movement was 27.19 miles a day.—*Commercial America.*

THE CANTON-HANKOW RAILWAY.—Advices from Canton, dated March 13, state that the local gentry and the shareholders in the Canton-Hankow Railway continue to fight and wrangle with each other, and that affairs in connection with the enterprise are practically at a deadlock. Contrary to expectation nothing has been settled since the Viceroy Chou-fu arrived, and no progress can now be looked for until the Ministry of Posts and Communications intervenes or until a special commission is appointed by the government to mediate between the wrangling factions.

CANTON-KOWLOON RAILWAY.—Taotai Wên Ho and Lai Kwok Lin have submitted a telegraphic suggestion to H. E. the Viceroy for his approval in connection with the soliciting of subscriptions for shares of the Canton-Kowloon Railway Company. The suggestion is as follows:—They proposed to temporarily open a register for shares of $10 each at the Chinese Imperial Telegraph Administration offices at Hongkong. A first call of $1 will be collected on every share at the Dutch Bank. When more subscriptions are obtained, an office will be opened for the purpose, and when subscriptions are fully collected, the capital will be deposited at the Hongkong and Shanghai Banking Corporation, Hongkong. Subscriptions for shares will be only collected up to the sum equal to £750,000. Shareholders are to enjoy the privilege as stipulated in the agreement entered upon by the Chinese Government with the British syndicate at Peking.

CHINESE EAGER TO BUILD RAILWAYS—The people of the two provinces of Kwangsi and Yunnan appear to be most eager to build their own railways and work their own mines in their provinces. The Kwangsi community residing at Canton are now busily engaged in arranging a meeting on the 17th instant, at the Kwangsi Assembly Hall, to discuss matters. The promoter, Ho Kin Fu, has drawn up a prospectus giving in detail all the important points concerning the railway and mining of those provinces. Recently, a letter was received from Yunnan stating that the people are in need of help in the way of capital for the construction of their railway and working the mines of the province. The letter earnestly asked the Canton people to assist them and to inform and request Cantonese abroad to subscribe capital so as to help them to carry out their proposals. The people of these two provinces have for a long time past been in fear lest the interests of railway and mining of these provinces should fall into the hands of foreigners.

EGYPTIAN ENGINEERING CONTRACTS.—The January number of the Journal of the British Chamber of Commerce of Egypt contains a table showing that during the last three years more than half of the contracts made by the Departments of Finance and of Railways were secured by British firms. The contracts were considerable, and were chiefly for locomotives, goods-wagons, rails, signal apparatus, etc. Locomotives entire and parts thereof were also supplied by Germany. Belgium tendered successfully for wagons, bridge and roofing materials, screws, and parts of locomotives. Small machines and oil were the principal contracts obtained by French firms. The figures given for the years 1903, 1904, and 1905, respectively, were as follows: United Kingdom, $1,673,125, $2,472,300, and $2,250,000; Belgium, $562,045, $824,575, and $1,076,500; France, $5,580, $240,000, and $100,000; Germany, $166,425, $148,555, and $432,000; other countries, $433,260, $569,745, and $399,935, making a total of $2,834,855 for 1903 and of $4,015,175 and $4,158,435 for 1904 and 1905, respectively.

PUBLIC AND PORT WORKS, DOCKS, WHARVES, ETC.

KAWASAKI DOCK COMPANY.—The Kawasaki Dock Yard Company of Japan has increased its capital from $3,000,000 to $5,000,000, to engage also in the construction of locomotives, railway carriages, cast steel work, firearms, steel and dynamos. The capital is to be further increased to $10,000,000.

KALLANG RESERVOIR BIDS.—At a special meeting of the municipal commission, March 23, the president mentioned that six tenders had been received for the construction of the new Kallang reservoir, ranging from $780,387 to $1,484,629. That of the Westminster Construction Company, at $907,641 was unanimously accepted.—*Singapore Free Press.*

NEW NAVAL DOCK AT KURE.—The Japanese Naval authorities have decided to construct a big dock at Kure Naval port. The dock is to be of special design, various contrivances being brought into requisition to introduce water into the dock after the completion of vessels built therein. The fact that about half a million yen was required for the launch of the battleship *Satsuma* has, it is reported, induced the authorities to design the new dock.

CANTON RIVER BRIDGE.—Wm. Danby, the engineer for the construction of the iron bridge across the Canton River, has prepared another plan for this. The two Folly Rocks will be utilized as the foundation of the bridge, and the middle part of the bridge will be made movable, so that it can be raised when steamers are passing. Since the opening of the register of the Canton River Iron Bridge Company, the demand for shares has been very brisk, and the proposed capital of the company is expected to be fully subscribed in a very short time.

HONGKONG AND KOWLOON WHARF AND GODOWN CO. —The report of the Hongkong and Kowloon Wharf and Godown Company, Ltd., for the year ending December 31, 1906, shows that the profit on working amounted to $407,693.17, as compared with $390,753.10 in 1905. It is proposed to pay a final dividend of five per cent, transfer $135,000 and $10,000 to depreciation and repairs, and insurance accounts, respectively, and carry forward $3,047.91. The total loss caused by the typhoon is put down at $322,000 and further expenditure, the immediate result of the typhoon, is estimated at $247,000.

IMPROVEMENTS AT VLADIVOSTOK.—Mr. Roger S. Green, the U. S. Consul at Vladivostok, writes Washington that the municipality has determined to undertake the construction of the electric street railway and power plant and an engineer is engaged upon plans and estimates. The present intention seems to be not to give the contract for the whole to one firm, but to buy the necessary material from a number of different parties. A contract for a municipal telephone system for Vladivostok has been awarded to the Russian branch of a German firm. The annual subscription for a single instrument is to be $38.62 gold.

SHIP BUILDING AND GENERAL MARINE

NORTH GERMAN LLOYD OFFICE IN SINGAPORE.—Berlin, March 13.—The North German Lloyd will establish a head-office at Singapore on 1st September next.

DAKOTA CARGO INSURANCE.—Messrs. A. H. Rennie & Co., general managers of the Hongkong Milling Co., Ltd., announced that the Tokio Marine Insurance Co., Ltd., had paid their claim in full for the *Dakota* cargo.

HONGKONG STEAM WATER BOAT CO., LTD.—At a private general meeting of shareholders of the Hongkong Steam Waterboat Company held on March 28, resolutions were adopted authorizing the amalgamation of this concern with the Union Water Boat Co.

SHANGHAI TUG AND LIGHTER CO.—At a meeting of the Board of Directors of the Shanghai Tug and Lighter Co., Ltd., held on March 22nd, it was voted to recommend the payment of a final dividend for the year ending December 3, 1906, of 3½ per cent. on the preference shares and 3 per cent. on the ordinary shares, making 8 per cent. for the year.

NIPPON YUSEN KAISHA.—The Nippon Yusen Kaisha is reported to have a scheme on foot to increase the number of steamers on its Bombay line to ten, for the purpose of bringing into service seven captured steamers placed at the disposal of the company, and to put on the same run the *Omi Etoro, Wakamiya, Takasaki, Kageshima, Kagoshima, Tenshin, Benten, Ebohi, Ryojun*, or *Moyori*, and to place on the European line, the *Ceylon, Bombay*, and *Colombo* now on the Bombay run, in addition to the twelve steamers.

OYA SHIPPING COMPANY ABSORBED.—It is reported from Osaka that the Oya S. S. Company is absorbed by the Osaka Shosen Kaisha. The Oya Company has hitherto been running vessels—the *Kotsu Maru* and the *Miyajima Maru*—on the Vladivostok line, and to the Hokkaido—the *Amakusa Maru*. Its capital was -Y-465,000 and it has been in receipt of a small subsidy from the Treasury. The period of its charter expired on March 30, which fact is the proximate cause of the change announced. The Osaka Company will pay to Mr. Oya -Y-365,000, and Mr. Oya will become a shareholder of the Shosen Kaisha to the extent of -Y-100,000. —*Kobe Herald.*

TOYO KISEN KAISHA.—A dividend of 12 per cent. was announced at the general meeting of shareholders of the Toyo Kisen Kaisha, March 20 at the Tokio chamber of commerce. It was also announced that the company's new ships now under construction are expected completed during the year. The report and the distribution of the profits follows:—

	Yen.
Gross profits	220,340,092
Brought from last term	8,878.083
Total	229,218.175
Reserve	11,500,000
Dividends to shareholders (12%)	217,100.000
Carried forward	618.170

RUSSO-CHINESE STEAMSHIP AND TRADING COMPANY.—The *Dalney Vostok* states that this company has been organized with headquarters at Odessa for the purpose of developing direct trade between Russia and China. The program of the company includes the establishing of direct lines between Vladivostok and Saghalien and between Nikolaevsk and China, Indo-China, and India.

After the satisfactory development of the business, the Company intends to extend the steamship service to European Russia as well as to the Sea of Okhotsk, the Kamchatka coast ports and various Eastern ports. Branches will be established at Vladivostok and Amur coast ports.

MINING, MINERALS AND THE METAL TRADE

COAL ON FUTAKO ISLAND.—Nagasaki advices are to the effect that a large coal strata has been found on Futako, one of the islands of Takashima group and owned by the Mitsu Bishi firm.

MANCHURIA IRON AND COAL.—A report from Mukden announces the discovery by a Japanese student of thirty iron and coal mines in Fenghwang, Kwantien, Hsiuen and Antung.

THIBETAN GOLD MINES.—A report from Chungkiang states that five Belgian mining experts arrived at Tachenlu some days ago, and contemplate entering Thibet with a view to investigating gold mines. The Chinese Imperial Resident of Thibet refuses to give passports.

CHINESE COAL OUTPUT.—The Chinese Engineering and Mining Company announces that the total output from the company's three coal mines in North China for the week ending March 9, 1907, amounted to 16,056.54 tons and the sales during the same period were 13,283.07 tons.

NIPPON KEROSENE OIL CO.—The Nippon Kerosene Oil Co. at Kashiwazaki, Niigata, will pay an interim dividend at the rate of 24 per cent. per annum and to set apart *yen* 220,000 as a reserve. The firm decided to add half a million *yen* to the present capital, making a total of ten million *yen*.

INVESTIGATION OF THIBETAN MINES.—The American Minister at Peking has requested from the Waiwupu a passport for a mining engineer who intends to enter Thibet with a view to prospecting, but the Waiwupu has replied that any protection to be given in Thibet is so difficult that it is desirable that he should defer his journey.

THE MANCHURIAN GOLD MINES.—According to a Peking dispatch the Military Governor of Heilungkiang has wired to the Waiwupu that he has decided to pay 380,000 taels to Russia, being the aggregate cost of machines and buildings of the gold mines in Kwan-yin shan and Muho, which have been already returned to China.

LAMA TIN MINES.—A dividend of two shillings and six pence per share has been declared by the Pusing Lama Tin Mines, Limited, payable in London and will be paid to shareholders resident in the Straits Settlements and the Federated Malay States, as soon as the register of local shareholders at that date is received from home.—*Malay Mail.*

KOREAN GOLD MINING CO.—A Seoul despatch dated March 12 states that Mr. Tsuda, formerly a member of the House of Representatives for Okayama prefecture, has organized a company with one million yen capital under the style of the Korean Gold Mining Company in co-operation with the American Ohio Mining Company. This is the first instance of the establishment of a company in co-operation with foreigners under the Japanese commercial laws.

COPPER MINES IN YUNNAN.—The Ministry of Agriculture, Works and Commerce is consulting with the Government and the Viceroy of the Yun Kuei Provinces for the appointment of a reliable high official as Director-General of Copper Mines in Yunnan, so that the rich mineral resources of that province may be developed in order to meet the great demand for coining copper cents and check the importation of foreign copper. Funds have to be raised for developing the mines, and the Viceroys of the provinces are being consulted with this object.—*N. C. Daily News.*

OIL AND WATER GAS PRODUCTION.—Returns have been received from 477 oil and water gas production companies, and these show that the total production of water gas in 1905 was 82,959,228,504 cu. ft. Of this quantity 5,547,203,913 cu. ft., or 6.7 per cent were lost by leakage, etc., leaving 77,412,024,691 cu. ft. as the net production obtained and sold. As the quantity of gas made and sold as coal gas and by-product coke oven works was 40,454,215,132 cu. ft., it appears that the consumption of water gas, and gas made from crude oil was nearly twice as much as that made from coal.

KUANTAN TIN MINING CO.—The third annual general meeting of this company was held at the registered offices of the company, Gresham House, Singapore. The report and accounts for the year ended Dec. 31st last were presented and adopted. A dividend of $3.50 per share was declared, being at the rate of 3 per cent which, together with the interim dividend of $2 per share for the half year ended June 30th, 1906, made up a dividend of 5.5 per cent for the year.

Mr. H. Abrams and Dr. de Vos, the retiring directors, were re-elected, and the shareholders present expressed their satisfaction by formal resolution, passing a vote of thanks to the directors, manager, and secretary.—*Singapore Free Press.*

OIL IN SIAM.—Petroleum is found in Muang Fang in the extreme north of Siam. The amount of oil produced is quite insignificant. The oil may be collected by skimming the water which collects in shallow pits dug for the purpose. The oil thus collected is black in color and very viscous. It is supposed that this occurrence is geologically connected with the oil-fields of Burmah. This oil is not likely to become of any importance until communications have very much improved. At present it would be practically impossible to open the district so as to be able to work the deposits, even if they have any value, which is an open question. Oil has been frequently reported in Kedah, and experts have pronounced it to be there; but it is very doubtful whether there is any truth in these assertions, as no good samples have ever been obtained. It appears that people have been misled by the presence of considerable quantities of marsh-gas in some undrained ground.—*Bangkok Times.*

FINANCIAL AND MISCELLANEOUS

TOKIO RICE EXCHANGE.—The *Japan Advertiser* announces that the Tokio Rice Exchange has increased its capital from four million to twelve million yen.

TOKIO AUTOMOBILE COMPANY.—The Tokio Automobile Company has reduced its capital stock to one million yen owing to the dullness of the money market.

THE PACIFIC CABLE CO.—The shore end of the America-Japan submarine cable via Ogasawara has been transferred from Oshimashiden, near Kawasaki, to Etchujima, in Tokyo-fu.

SEREMBAN ESTATE RUBBER.—The general meeting of the Seremban Estate Rubber Company was held on March 8th in Colombo. A dividend of 19 per cent. was declared, making 24 per cent. for the year.

HARBIN FLOUR MILL SYNDICATE.—The proprietors of the flour mills at Harbin have sent a deputation to St. Petersburg with a view to the forming of a syndicate in which the Russo-Chinese Bank will be interested.

IRON WORKS ON THE SUNGARI.—The *North China Daily News* has received advices from Mukden to the effect that a certain Englishman is projecting the building of iron works along the southern bank of the River Sungari.

PORT ARTHUR-CHEFOO CABLE.—Advices from Peking state that negotiations are in progress between China and Japan looking to the installation of a submarine cable between Chefoo and Port Arthur. Japanese capital is behind the project.

CABLE TO DALNY.—The Chinese and the Japanese Governments are negotiating in regard the construction of a joint cable from Dalny to Chefoo, to replace the former cable belonging to the Great Northern Cable Company destroyed by the Japanese during the Russo-Japanese war.

THE SHANGHAI ICE, COLD STORAGE AND REFRIGERATING CO.—The report of business for the year 1906 showed a net profit of Tls. 24,995.97. An eight percentum dividend was declared and the balance of Tls. 8,-145.97 carried forward in order to have a fair balance to meet threatened competition.

GERMAN ORIENT SYNDICATE.—A company has been formed in Berlin under the name and style of the German Orient Syndicate, for the purpose of promoting and extending German commercial interests in the Near and Far East, and of facilitating and safeguarding German commercial relations with those parts of the world.

NATIONAL BANK OF INDIA.—The profits of the National Bank of India, Limited, for the year ended 31st December, 1906, are £261,665 which the Directors propose to deal with as follows:—Dividend for the year 12 per cent.; to Reserve Fund, £50,000; to Premises Account £10,000; to Pension Fund, £7,500; carrying forward, £122,165.

TIN IN YUNNAN.—The Yunnan Syndicate, a French mining venture, has just issued its report. The latter dwells upon extensive tin finds in the company's concession in that province. A trial shipment to London was sold at a profit. The Syndicate is now engaged in promoting a French company to work these tin deposits, which are most abundant in the district of Ling-Ngan.

GRAND HOTEL, YOKOHAMA.—The net profit for the half-year of the Grand Hotel, Yokohama, after providing for general expenses, Directors' and Auditor's fees, and Sundry Creditors, and after writing off bad or doubtful debts, amounts to Yen 51,390.77 which it is proposed to apply as follows:—In payment of a dividend of -Y-6.00 per share for the half year 30,000.00; for depreciation, 7,400,00; to be carried forward, 13,990.77.

THE TELEPHONE IN MUKDEN.—At the request of the Tartar General of Fengtien the Ministry of Posts and Communications has appointed two officials to proceed to Mukden to establish a telephone service. The reason for this step is to instal the plant purchased from Japan; the service is expected to be inaugurated within the next few months. The system will gradually be extended to other big and important cities and treaty ports in Manchuria.

KOBE SUGAR REFINERY.—The first half-yearly report of the Kobe Sugar Refining Company shows that the total net profit for the period has amounted to -Y-12,-977. Of this sum, -Y-1,000 has been placed to the legal reserve, -Y-500 to the reserve for the maintenance of machinery and buildings, -Y-400 paid for bonuses to the officials, and -Y-10,020 for a dividend at the rate of 20 per cent. per annum, while a surplus of -Y-1,057 has been carried forward.

FLOUR MILLING MACHINERY.—United States Vice-Consul Babbit of Yokohama sends Japanese newspaper statements that many large flour mills have been projected in the kingdom. Those of the Imperial, the East Asia, and Meiji Flour companies will most probably be situated at Tokio and it is estimated will, with other new mills, produce 3,000 sacks daily. The establishment of a flour mill at Hankow, China, and of mills in Manchuria is also under contemplation.

THE AMUR RIVER FISHERIES.—Messrs. Chen Hshing-chou and Chao Han, two prominent merchants of Harbin, have obtained a franchise from the Tartar General of Heilungkiang and Kirin provinces to form a company for the purpose of exploiting the fisheries of the Amur and other streams in that territory. The capital of the company is Tls. 200,000. Three-quarters of the capital has already been subscribed and active measures have been taken to commence work at once on the Amur.

AMERICAN INDUSTRIAL EXHIBIT AT TOKIO.—One of the leading features of the industrial exhibition at Tokio that opened there March 20 and will continue until June 20, is a display of American machinery and machine tools. A number of American machinery houses have sent equipment there, and Takata & Co. of New York are also interested in the exhibit to the extent of controlling 3400 square feet of space for the display of American and European machinery. The equipment from the United States predominates.

CHARTERED MERCANTILE BANK.—The Chartered Mercantile Bank has announced from the head office that the net profits for the past year to 31st December, 1906, including the amount brought forward, are £90,-800, and that at the forthcoming general meeting of shareholders the directors will recommend a final dividend of 3½% on "A" and "B" shares,—making 6% for the year free of income tax; that £35,000 be placed to Reserve, £2,000 to Officers' Pension Fund and £20,000 carried forward.

CHARTERED BANK.—The head office of the Chartered Bank of India, Australia and China made the following announcement by cable, March 28:

"At the approaching meeting of shareholders, the Directors will recommend a dividend for the past half year at 13% per annum, free of income tax, that £25,000 be written off Bank premises account, that £100,000 be placed to reserve (which will then stand at £1,075,000), that £93,000 be carried forward as undivided profit, and that a bonus of 10% be paid to the staff of the Bank."

Pahang Rubber Co.—The Pahang Rubber Co., Limited, incorporated in the territory of Hawaii, with $150,000 capital, have leased 2,000 acres in Pahang on which to establish a plantation of *Hevea* rubber. The program for 1906 called for planting of 200 acres and it is planned to have 1,000 acres in rubber within three years. Dr. E. C. Waterhouse, of Honolulu, is president of the company, Mr. D. P. R. Isenberg vice-president, and Mr. Fred T. P. Waterhouse secretary and treasurer. The manager on the estate is Mr. M. Hording.

Cotton Soars.—The foundering of the G. N. steamer *Dakota* has affected the raw cotton market, says the *Chefoo News*. American cotton which was quoted at the end of last month, has risen by -Y-2 since the news of the disaster. The steamer had on board five thousand bales, of which 1,500 were consigned to Kobe. As it has been announced to Kobe that there is little or no hope of salving the cargo, raw cotton may go up still higher in this week. There is a good stock of Bombay cotton in this country and the market was dull in consequence of the spinning companies' reluctance to buy for the time being. The result has been that prices have had to be cut. The ruling price at the end of February was, however, high, and the present quotation is said by experts to be nearer a reasonable figure.

World's Rubber Culture.—Says an editorial writer in *The Electrical Review* (New York, January 19), noting a recent report of the U. S. consul at Rio Janeiro: "It is said that there are in Ceylon over 100,000 acres which have been planted in rubber, and in the Malay peninsula about half as much more. It is estimated that Mexico has about 100,000 acres planted in rubber, making in all about 275,000 acres, which should produce before long about one-quarter of the world's probable consumption. The results from these plantations seem to have been so successful that the work might be enlarged, as this would not only render us less dependent upon the natural forests, but would stimulate the Brazilian rubber-producing states to begin artificial cultivation there."

Demand for Rubber.—Some idea of the enormous and ever-increasing demand for rubber, made by modern electrical, motor, and other industries is gathered from the fact that the total output of rubber for 1906 amounted to about 75,000 tons, valued at £30,000,000. Of this quantity 63 per cent came from Tropical America. All the plantation rubber that comes on the market does not make more than 2 per cent of the world's total product. Scarcely a day passes without the development of some new use for rubber, and it is quite possible that a few years will see many streets paved with rubber instead of wood-blocks; such as the rubber-pavement outside the Savoy Hotel, which scarcely shows signs of wear, although laid down about three years ago.

Singapore and Johore Rubber Co., Ltd.—The third report of the directors to the shareholders at the meeting on March 26th reads:—

Your Directors beg to submit the Accounts for the year ended 31st December last. It will be seen that a further sum of $51,644.62 has been expended on Development making the total to date $89,241.54.

Labor.—The difficulty of securing a sufficiency of coolies has at last been surmounted. A force of 443 Tamils has been successfully recruited from India and Javanese coolies are now coming in freely. The want of sufficient labor has heretofore considerably delayed the opening up the Estate but your Directors are now in a position to push ahead with development and at will be seen from the Manager's Report they expecs to have over 1,200 acres under Rubber by the end of 1907.

Gambier.—Although the Estate is producing an absolutely pure article it has been difficult to get buyers to take an interest in the product and further planting has been stopped for the present. Samples have been freely distributed and enquiries which have emanated therefrom lead your Directors to hope that ultimately a market will be found.

Buildings.—During the year further lines have been erected and there is now sufficient accommodation of this sort for all the coolies likely to be required on the Estate. A Bungalow, Office, Shop, and Hospital have also been erected.

PHILIPPINES RAILWAYS

The work on the military railroad between Camp Overton and Camp Keithly in Mindanao will commence this month. The road will be seventeen miles in length. In this connection, the dock at Camp Overton will be rebuilt and enlarged.

The Philippines Railway Company has about twenty miles of track graded in Cebu including seven miles on the line running south towards Argao and thirteen miles approximately on the north section towards Danao. Of these sections steel has been laid for one mile on the north section and two miles on the south line.

In Panay the road is graded from Iloilo to Santa Barbara, a distance of about ten miles. The balance of the first twenty mile section is under way. Steel has been laid from Iloilo to Jara, a distance of two miles.

Distributed equally between Cebu and Panay are about 100 flat cars for construction purposes with a sufficient number of locomotives to expedite the work. In addition to the present equipment the company has ordered six additional locomotives of lighter build and these will also be divided between Iloilo and Cebu.

The construction work is progressing as rapidly as the slow arrival of supplies permits. The labor both in Cebú and Iloilo has been found very satisfactory and no difficulty is anticipated on that score. By the middle of May over 4,000 tons of steel will have arrived and the work of laying it will then commence in earnest. Every effort is being put forward to accomplish as much as possible before the rainy season sets in.

The Lepanto Mining Company has made application to the Philippine Commission for a franchise for a railroad to connect the Mancayan copper property with Bangar on the west coast of Luzon, a point about twenty miles north of San Fernando, Union, with a good harbor. This line will be about fifty miles in length and there is little doubt but that the franchise will be granted as this road, while ostensibly to carry the copper ore to the coast, will develop the most fertile tract of country in Northern Luzon and tap that belt in Luzon known as the "Philippines Temperate Zone."

Mr. Loomis F. Goodale, who succeeds Mr. Mollitor as supervising railway expert for the Philippines, arrived in Manila April 17.

The Manila Electric Railroad extension to Fort William McKinley was thrown open to the public April 18.

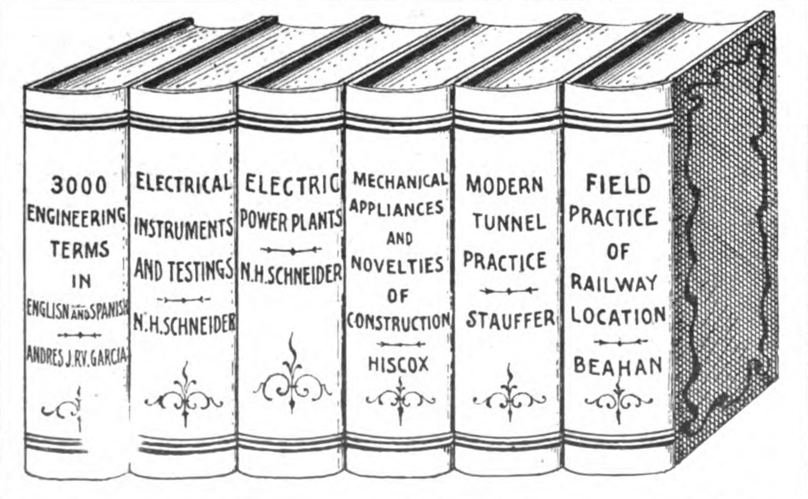
The Manila Railway is doing construction work on all its lines in Luzon in order to advance the work as much as possible before the rainy season.

CURRENT NEW YORK PRICES, MARKET PRICES OF METALS, MINERALS, CHEMICALS, ETC.

Selected from the Engineering and Mining Journal.

Abrasives.—		
Borth, good drill quality	carat	$ 85.00
Carporundum, grains, 16		.10-.17
Corundum	" "	.07-.10
Emery, grain	" "	.035-.045
Pumice Stone, American powdered, 100 lbs		1.60-2.00
Acids.—		
Hydrochlocic 20°	lb	1.25-1.50
Nitric, 38°	"	4.25-4.625
Sulphuric, 66, bulk	ton	18.00-20.00
Aluminum, 99°	lb	.36
Antimony, needle	"	.15-.16
Arsenic, white	"	.07⅛-.08
Asbestos.—		
* No. 1, crude	sh. ton	175.00-200.00
Fiber No. 2, paper stock	"	20.00-25.00
Asphaltum.—		
Trinidad	ton	30.00-40.00
California	"	20.00-30.00
Bleaching powder, 35%	100 lb	1.30-1.50
Blue Vitriol (copper sulphate),		7.25
Bone Ash	lb	.07¼-.07¾
*Caps detonating	"	7.50
Cement.—		
Portland, American, 500 lbs.	bbl	1.55-160
Foreign	"	2.25-2.50
Rosendale	"	.85
Clay, China.—		
American common	lg. ton	8.00-9.00
Foreign	"	11.00-18.00
*Dynamite 40%	lb	.22½
Fire brick, American	m	30.00-40.00
Imported	"	30.00-45.00
Fire clay, St. Louis Mill	ton	2.50
*Fuse-Blasting	1,000 ft	7.50
Graphite—American ore, common	lb	.01-.10
Artificial	"	.06
Gypsum-Fertilizer	lg. ton	7.00
Rock	"	4.00
Lead	lb	.06
Magnesite—Greece, crude, 95%	lg. ton	7.00-8.00
Bricks, domes	per m	1.60-2.00
Manganese, pure, 98-99%	lb	.75
Ore, 80-85%	sh. ton	27.00-35.00
Mercury, flask	75 lbs	40.50-42.00
Paints and Colors.—		
Litharge, American P'w'd	lb	.07¼-.07½
Ochre, Am. Com	sh. ton	8.50-9.00
Paris Green, pure, bulk	lb	.21-.23
Turpentine, spirits, bbl	gal	.70-.71
White lead, Am. dry	lb	.06⅜-.06½
Am. in Oil	"	.07-.07½
Zinc, white, Am. extra dry	lb	.05¼-.05½
Phosphates, Acid	per unit	.65-.67½
Florida hard rock	"	7.50
Land pebble 68%	per unit	4.50
Potassium Cyanide (98-99%)	lb	.18-.19
Platinum	Oz	38.00
*Powder black blasting	lb	.13
*Judson	"	.13½
Pyrite, Domestic Non-arsenical, lump unit		.11-.11½
Imported non-arsenical		.13-.13½
Imported, arsenical	"	.12-.12½
Silica, Lump quartz	sh. ton	2.50-4.00
Ground quartz, ordinary	"	13.00-15.00
Glass sand, ordinary	"	2.75
Silver	Oz	.67¾
Sodium cyanide (100% KCN)	lb	.18-.19
Saltpeter	"	.067-.068
*Steel, octagon drill	"	.16
Sulphur, Louisiana prime	lg. ton	22.12-22.50
Roll	100 lbs	1.85-2.15
Flowers sublimed	"	2.20-2.60
Talc—Domestic	sh. ton	15.00-20.00
Italian, best	"	35.00-40.00
Tin	lb	.42¾
Zinc, metallic ch. pure	"	.15
Dust	"	2.05¾-.06

*Manila quotation.



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THE FAR EASTERN REVIEW
COMMERCE ✇ ENGINEERING ✇ FINANCE

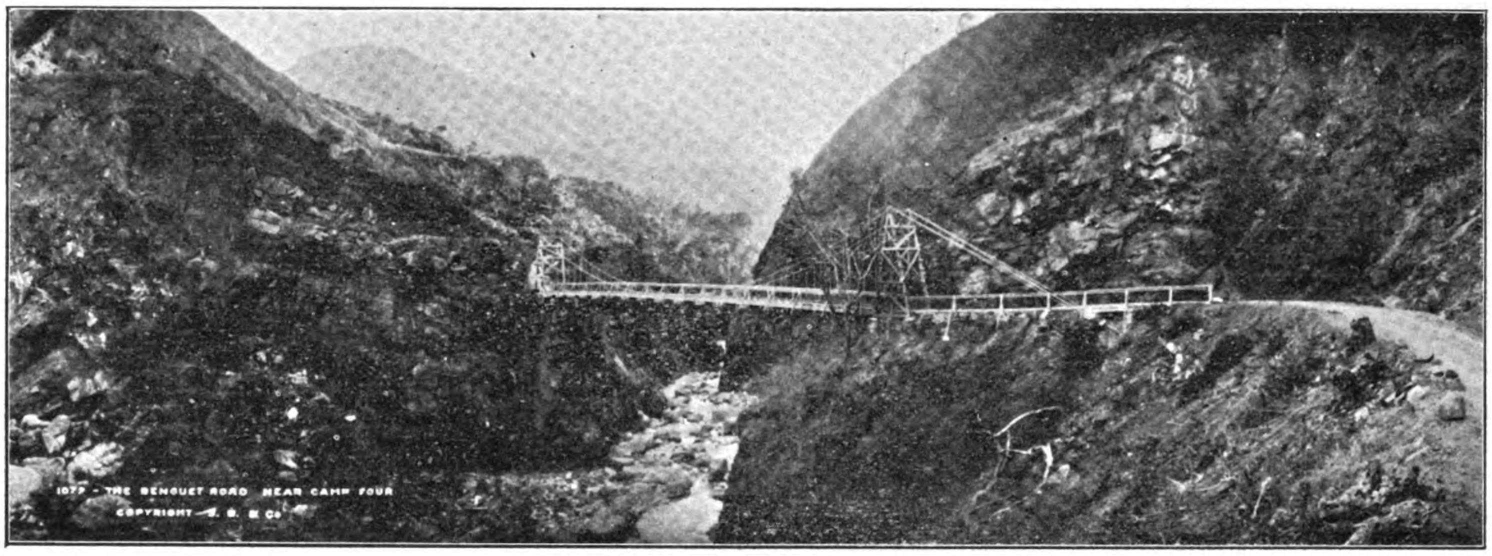
VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, MAY, 1907. No. 12.

BAGUIO, THE SIMLA OF THE PHILIPPINES

A reservation of twenty square miles on a plateau with an elevation of 5000 feet is the center of what is termed the temperate zone of the Philippines. This reservation is known as Baguio and is situated in the province of Benguet about 170 miles north of Manila and accessible by railroad and stage or automobile. It is the summer capital of the Philippines and is rapidly growing in popularity as the mountain retreat of the inhabitants of the islands and the foreign residents who are now substituting a sojourn in Baguio for a trip abroad during the heated term.

It might be said that the Philippine commission found Baguio. At least it was that body that was responsible for its promotion. At first the commission simply intended the plateau for a retreat where its members could escape the torrid climate without taking a vacation and leaving the islands, but the necessity of having a cool and bracing climate for all insular employees resulted in the expansion of the original idea and now the commercial interests as well as private interests have become impressed with the advantages of a temperate climate for recuperation within easy distance of the torrid zone during the months of February, March, April and May, the period known in the Philippines as the heated term. It might be said that the city of Baguio is a center for recuperation for the Philippines, the establishment of which was promoted by the government with the result that every interest in the Philippines is participating with evidence of substantial returns in health and renewed vigor for all.

When the commission decided to take advantage of the Baguio climate and do away with the necessity of a vacation, the hills were only accessible by the most difficult and circuitous trails used by the Igorots. From Manila it was a week's journey and only the hardiest could hope to survive. It was then decided to build a suitable wagon road and estimates were furnished at what seemed a very reasonable figure. It was found that these estimates were far from correct and at one time the work was almost abandoned when it was discovered that there were engineering problems to solve never anticipated in the original surveys. However, to the credit of the government, it refused to turn back after it put its hand to the plow and, assailed by the most severe critics, it completed, under the supervision of Colonel Kennon of the United States Army, a highway to the mountains that will stand a monument to American enterprise in the far east, and the rugged scenic beauties of which are not duplicated even in the delightful cañons of the Rockies. This road was completed in 1905 and instead of climbing for a week to reach this center of recuperation the Philippine pilgrim may now leave Manila on the Manila and Dagupan line at 10 o'clock at night and by taking an automobile at Dagupan arrive in Baguio in time for breakfast.



SUSPENSION BRIDGE OVER GORGE NEAR CAMP FOUR ON THE BENGUET ROAD

In the meantime surveys have been completed as far as Camp One for a railway from Dagupan which will be completed within ten months. Camp One is 21 miles from Baguio by the Benguet road and already capitalists are interested in securing a franchise to complete the connection by an electric line.

The promotion work of the government began with the setting aside of an area of twenty square miles on the most extended plateau available. Plans for a model city were prepared and surveys made dividing the area into a business and a residence district. A certain section was reserved for the proposed civil government buildings and residences and the military selected a most desirable site for a convalescent post now known as Camp John Hay. The military reservation covers an area of 550 acres and is included in the general Baguio reservation.

When the proposed city was thus laid out into lots an auction was held and in all almost 200 lots were sold to the highest bidders. In this way the inhabitants and foreigners were interested in the development of the city. All the money secured from the sale was turned over to the provincial authorities and utilized for the purpose of building roads and thoroughfares throughout the proposed city and up to the present time over ten miles in streets have been completed and carefully surfaced with macadam, making every section easily accessible by automobile or carriage. The result is that the residence portion is being rapidly built up with summer residences and already two modern hotels have been built. The present season may be said to have initiated a general stampede to the hills, as the transportation facilities have been greatly improved. From reports both the hotels have been filled to overflowing since the first of February and there is not a cottage that is not occupied by seekers after the ozone of the hills. Within another year it is safe to predict that the dream of the promoters will be more than realized. It might also be said that the enormous expenditure for the construction of the Benguet road so freely criticised at the time it was underway is now recognized by the most bitter

(Continued on page 376.)

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PROSPECTS FOR PHILIPPINE SUGAR

Weaker and weaker grow the arguments of the sugar trust against the "square deal" for the Philippines in the form of free trade. The opposition to the free entry of Philippine sugar into the United States is apparently confined at this time to political juggling in congress, ostensibly to keep the Philippine bill from escaping from its living tomb in the senate committee room.

According to the figures of the bureau of statistics of the department of commerce and labor for the year 1906, six and one-half billion pounds of sugar were consumed in the United States, and of this one-fifth was produced in the United States proper, one-fifth in the insular possessions and THREE-FIFTHS were imported from foreign countries. Of all this amount of sugar imported into the United States the Philippines furnished but 26,283,929 pounds or .006 of the total amount imported into the United States to meet the growing demand. Of this three-fifths, Cuba supplied 2,683,893,033 pounds, leaving a balance of 1,180,772,628 pounds minus the paltry 26,283,929 pounds from the Philippines supplied by the Philippines to come from foreign countries not bound by any ties to the United States or forced to submit to the dictates of a senate in the grip of the sordid money power.

It is remarkable how agile the enemies of Philippine sugar can become when there are indications that the sugar producer in the United States is becoming undeceived, and is beginning to realize that he is being hoodwinked by a ring that has for its purpose the retention of the control of the sugar product so as to dictate prices to the consumer. Even the *American Sugar Industry and Beet Sugar Gazette*, one of the leading sugar publications in the United States, in an unguarded moment admits that even with the rapid increase of sugar production it has not kept pace with the increased consumption. The natural conclusion is that all the sugar that the Philippine Islands could produce would not make up the present deficit and that if past experience were a criterion for the future of sugar, the shortage in production to meet the demand would increase instead of showing any signs of diminishing. Referring to the report of the bureau of statistics of the department of commerce and police for the year 1906, the *American Sugar Industry and Beet Sugar Gazette* says:

"Complete figures compiled by the Bureau of Statistics of the Department of Commerce and Labor show that the quantity of sugar brought into the United States in 1906, plus that produced at home, minus the quantity exported, amounts to nearly six and one-half billion pounds, and if we divide into this enormous total the number of people in the United States we get an average consumption of 76 pounds per capita. The cost of this six and one-half billion pounds of sugar to the consumer must have been over 300 million dollars, since the average wholesale price in the New York markets of refined sugar has been, for the year, 4½ cents per pound; and when to this are added the cost of transportation to the consumer and the profit of the retailer, it is quite apparent that the cost to the consumer must have been more than 300 million dollars during the year just ended.

"One-fifth of this enormous total of six and one-half billion pounds of sugar was produced at home, another one-fifth was brought from our own islands, and the remaining three-fifths from foreign countries, these statements being of course in round terms. The actual quantity of sugar imported from foreign countries, including the Philippines, during the year, as shown by the reports of the Bureau of Statistics just completed, was 3,864,665,661 pounds; the quantity brought from Hawaii and Porto Rico was 1,281,384,946 pounds; the quantity produced in the United States is estimated for the year at 1,304,600,000 pounds and the quantity exported was 25,731,407 pounds. Of the 3,864,665,661 pounds imported from foreign countries, 2,683,893,033 pounds was from Cuba; 425,372,363 pounds from the Dutch East Indies; 303,430,122 pounds from Germany; 163,496,319 pounds from the West Indies, exclusive of Cuba and Porto Rico; 713,627,104 pounds from South America, and 26,283,929 pounds from the Philippine Islands. The quantity contributed by our islands was, from Hawaii, 852,468,867 pounds; from Porto Rico, 428,916,079 pounds; and from the Philippines, 26,283,929 pounds (the latter figure, however, being included in the imports from foreign countries).

"More than nine-tenths of the sugar imported from foreign countries and all of that brought from our own islands was produced from cane, and less than one-tenth from beets. Of the production in the United States a little less than one-half was from cane and a little more than one-half from beets. Of the six and one-half billion pounds of sugar consumed in the United States last year, five and one-half billions was produced from cane and about one billion pounds from beets. This is in marked contrast with conditions in Europe, where by far the larger proportion of the sugar consumed is produced from beets.

"The quantity of beet sugar consumed in the United States varies greatly. The quantity brought in from foreign countries (chiefly Germany) was, in 1906, in round terms 375 million pounds, but in 1905, only a year earlier, the total was but 50 million pounds, while in 1904 it was 225 million pounds. The quantity supplied by home production is steadily increasing, having been but 185 million pounds in the year 1900 and in 1906 672 millions, having in that year for the first time exceeded the production of cane sugar in the United States. The cane sugar produced in the United States in 1900 was 390 million pounds and in 1906, 600 millions. Thus beet sugar production increased 260 per cent from 1900 to 1906, while cane sugar production increased but 54 per cent, these figures being based upon the latest estimates of the 1906 production. The actual increase in quantity produced in that period was, of beet sugar 487 million pounds, and of cane sugar 210 millions.

"Rapid as the increase in sugar production in the United States has been in recent years, it has not by any means kept pace with the increased consumption. The consumption in 1896 was 4,390,592,640 pounds, and in 1906, 6,415,389,120 pounds, the increase in consumption in the ten years being 2,024,816,480 pounds. The production in 1896 was 647,635,520 pounds, and in 1906, 1,304,607,360 pounds, an increase of 656,971,840 pounds. The increased consumption in the ten-year period was 2,025 million pounds and the increase in production only 657 million pounds. Thus the increase in consumption from 1896 to 1906 was more than three times as great as the increase in home production. The share which domestic sugar formed of the total consumption in the United States was according to the Bureau of Statistics of the Department of Commerce and Labor, in 1906, 20½ per cent; in 1905, 21.9 per cent; in 1895 19.4 per cent, and in 1880, 16 per cent. Prior to the civil war domestic sugar formed more than one-half of the total amount consumed in the United States having been in 1855, 57 per cent, and in 1845, 73 per cent, though at that time the quantity consumed per capita was far less than at present, having been in 1845, 20 pounds; in 1855 and in 1860, 30 pounds; in 1870, 35 pounds; in 1880, 43 pounds; in 1890, 53 pounds; in 1900, 65 pounds, and in 1906, 76 pounds per capita.

"The following table shows the sources of supply of the sugar consumption of the United States for the calendar year 1906:

	Pounds.
Cuba	2,683,893,033
United States	1,304,607,360
Hawaii	852,468,867
Porto Rico	428,916,079
Java	425,372,363
Germany	303,430,122
South America	173,627,104
West Indies (except Cuba)	163,496,319
Belgium	65,861,744
Philippine Islands	26,283,929
Austria-Hungary	9,934,000
Mexico	3,186,469
Other countries	9,575,715
Total	6,450,653,967
Less sugar exported	25,731,407
Amount available for consumption	6,424,922,560

"Of the above imports of sugar that from Porto Rico and the Hawaiian Islands entered free of duty, that from the Philippine Islands at 25 per cent below the regular rates of duty, and that from Cuba, under the reciprocity treaty, at 20 per cent below the regular rates of duty.

"The following table shows the annual average consumption of sugar in the United States and share thereof supplied by domestic production and by imports from Porto Rico, Hawaii and the Philippine Islands, by quinquennial periods, 1876 to 1905:

Annual average consumption for period—	Consumption of sugar in United States.	Share supplied by domestic production.	Share supplied by imports from the islands.
	Tons.	Per cent.	Per cent.
1876-1880.......	816,500	16 8	13 8
1881-1885.......	1,195,800	15 5	15 8
1886-1890.......	1,450,600	14 9	17 6
1891-1895.......	1,912,300	15.7	11.3
1896-1900.......	2,066,800	13.9	13 1
1901-1905.......	2,577,489	20.0	16.8
1906...........	2,864,913	20.3	20 3

Upon the heels of these figures setting forth the truth of the sugar situation *The Louisiana Planter* comes harping on the old argument and even goes so far as to claim that Cuba has been ruined in so far as the price for sugar is concerned by the fact that her sugar was admitted to the United States under a reciprocity concession and that the Philippines would also be ruined should their sugar be admitted for the reason advanced that prices would drop so low that the islands would soon have to find a more desirable market. All this when there is a shortage of production after using all the Cuban sugar of about 600,000 tons that must be supplied by foreign countries and which shortage, according to the latest statistics, must be expected to increase regardless of the wonderful strides made in the development of the sugar industry in the homeland. In substance *The Louisiana Planter* is willing to admit that the planters in the Philippines are capable of greater enterprise than the sugar planters in the United States in that the former would not only overcome this shortage but flood the market with such a surplus of their product that the trust would have to give it away to get rid of it. This sophistry may go down with that portion of the population that is ever ready to welcome mouthings of demagogues if the latter can produce some stray phantom by way of illustration. Commenting on the campaign of the Philippine delegation the *Louisiana Planter* has ignored the available data on the subject and presuming that its statements will be taken at their face value says:

"Every once in a while we read quotations from what Secretary Taft or Gen. Wood says or has said concerning the production of sugar in the Philippines, and its possible competition with American sugar. The arguments that are constantly uttered are founded upon the assumption that the present alleged primitive condition of things obtaining in the Philippines would be indefinitely maintained and that because the Philippines now produce but from 150,000 to 200,000 long tons of sugar, that that is the amount that we should anticipate as coming in competition with us. In the same breath, however, these advocates of concessions to the Philippines admit and assert that the sugar industry can be benefited there by adequate concessions; that the land is susceptible of producing large crops; that the labor supply is reasonably good; and that capital can be secured to engage in sugar production in the islands, provided the concessions be had. Thus it is manifest that they would expect to raise the present production of a quarter of a million tons to half or three-quarters of a million tons within a comparatively few years, as otherwise there would be but little inducement for American capitalists to go over there and engage in the sugar business.

"We see now what the reciprocity concession to Cuba has done, the way it has broken the Cuban market down to so low a figure that Cuban sugars are now occasionally going to England, notwithstanding their admission into the United States at some thirty-four cents per hundred pounds less duty than other foreign sugars, of the same grade. It would be the same way with the Philippines. They would break the market down upon themselves and the concession made to them in the way of reduced duties would surely be of little or no benefit to them; would lower the general markets of the world and the United States in particular and our domestic industries would be the sufferers, just as they are now by the increasing Cuban competition."

From the above the exiles in the Philippines are in a sad way. To hope to secure a market for their sugar means that they are simply courting self-destruction. Sweet as might be death by over production of sugar in the Philippines, *The Planter* warns us against the temptation to indulge. Very unfortunately our contemporary is needlessly alarmed but it would be unkind in the exiles not to appreciate the timely warning in view of the fact that there is every indication that the manufacturing interests of the United States may yet find in the Philippines a desirable market and take sufficient interest in our welfare to rescue the Cooper bill from its living tomb in the senate committee room and put it on its final passage. This prospective suicidal wave predicted by *The Planter* is even more pleasant to anticipate than the present unpleasant chloroforming experience.

SHIPBUILDING IN THE PHILIPPINES

Throughout the far east during the last ten years no industry has developed with greater strides than shipbuilding. From Moji to Singapore, every port of prominence boasts one or more prosperous dockyards and every year these institutions are expanding. In the Philippine archipelago, with its extended coastline and its growing interisland commerce, it would seem natural to expect that the shipbuilding industry would now be enjoying an unprecedented boom and be participating in prosperity equal to that the firms are indulging in along the coast of Japan, China and the Straits Settlements.

This, apparently, is not the case. Contracts that would seem to be the natural portion of the Philippine firms are secured with little opposition by Hongkong and Singapore. In fact the competition does not seem to lie between the Philippines and outside competitors but among the outsiders only. Singapore and Hongkong, for instance, decided between them which port would repair the McClellan. There were no Philippine bids, for the reason that there is no yard equipped to do the work and besides there seems good reason to believe that with the very best equipment no Philippine yard could hope to compete with outside prices. This conclusion is reached by the Philippine firms through their experience in bidding on contracts that they are fully equipped to handle.

This not only applies to contracts let by the United States and the insular government but to the construction of vessels for the interisland trade and the repair work necessary on the vessels in operation in Philippine waters.

It is true that the dockyards in the islands are entitled to free entry on material used in government construction but this is not true on material utilized in construction for the local trade. In either class of contracts the Philippine firms are obliged to compete with the dockyards of China ports having the advantage of cheap labor which by the provision of the Chinese exclusion law is shut out from the Philippines. This in itself makes such a difference in the cost of production that in competition with the China dockyards the Philippines suffer from a severe handicap but when there is added the heavy duties on materials imported into the islands competition with these free ports is impossible. In this connection it is only reasonable to conclude that the Philippine shipping firms may be depended upon to place their orders where the work may be done at the least cost. And experience has demonstrated that this conclusion is the correct one and to the discouragement of the unfortunate Philippine firms suffering from an undesirable and unreasonable handicap.

Viewing without prejudice the shipbuilding situation in the far east, it must be admitted that while the interests along the coast of Asia are encouraged in almost every form by the governments under which they are privileged to operate, nothing has been done in the Philippines by the powers that be to counteract in a substantial way the restrictions and handicaps, nor has the administration been consistent in going outside and evading the tariff and the exclusion law to secure the cheap construction, while the shipbuilding interests in the islands are obliged to conform to these restrictions and see the work to their hand go to outside bidders.

It is only natural that the shipbuilding firms of the Philippines are discouraged and timid about investing any more capital in improving their equipment. They feel that Hongkong and Singapore offer better returns, since these ports capture all the Philippine business. They conclude that if they would participate in Philippine shipbuilding and repair work their only hope to enter into fair competition would be to establish themselves where, at least, their competitors have no apparent advantage.

It is true that some effort has been made to secure legislation providing for the removal of the tariff on materials for the shipbuilding trade imported into the Philippines, but so far it has been ineffective for the reason that the spirit of co-operation seems to be lacking among the Philippine firms interested. Whatever has been done in this direction has been the work of a disinterested press with a minimum of moral support. The fight for recognition at Washington for the shipbuilding firms of Manila should be well organized and those in charge of it must overcome a mountain of prejudice in the war department. It is down on the books of the war department that in the early days of American occupation these same firms overcharged the federal government right and left. Those were days, so the military claim, when the Manila shipbuilding firms and the machine shops had the United States at their mercy and that they took an unfair advantage of the government. And so, right or wrong, the war department is far from being disposed to help these firms out at this time.

Whether the accusations of the war department be true or not, the deep seated prejudice must be overcome before favorable legislation may be expected. It is the war department that controls all legislation for the Philippines, and, if relief is to be had, the Manila firms must first make peace with that department. This cannot be done unless all those interested unite upon some course and hammer away at it until Washington realizes the justice of their cause. The Manila firms claim that at no time were their charges excessive and that they have ever endeavored to assist the military in every way. It only remains for them to convince Washington that this is so to secure a hearing.

Even should the tariff be removed on all materials used in the construction and repair of interisland craft, Manila would be at a disadvantage in competition with other firms in the far east on account of the high price of skilled labor, due to the operation of the exclusion act against the Chinese. The removal of the tariff, however, would prove a gain in the right direction and there is reason to believe that before many years the labor problem will be solved either by the development of skilled Filipino labor or by the suspension of the Chinese exclusion law as applied to the Philippine Islands.

In the meantime, the future of the shipbuilding trade of Japan, of China and the Straits could not be brighter. The equipment is improved yearly to keep pace with the increased output. With free ports, reasonable prices for labor and the encouragement given by the respective governments, the different shipbuilding companies have the far eastern field all to themselves.

So long as present conditions continue they may depend upon the bulk of Philippine contracts, which is no small consideration when the repair work of the federal government is taken into account. The prospect at the present time for remedial legislation at Washington is not bright and it will not grow brighter until, as we said before, some concerted action is taken to overcome the prejudice of the war department.

CIGAR MAKING IN THE PHILIPPINES VERSUS HONGKONG

The reported transfer of the Oriente Cigar Factory from Manila to Hongkong has been the subject of some discussion in the press of Hongkong and Manila as to the advantages to be derived from such a departure on the part of the company. Collector Hord, in charge of the bureau of internal revenue, has made a statement that seems to throw some interesting light on the subject and counteracts the impression that the enforcement of the internal revenue tax has injured the cigar or cigarette business of the islands. Mr. Hord admits that in the manufacture of cigars the manufacturer would have an advantage by locating in Hongkong from the cheap labor available, but corrects the misleading report that the Philippine government imposes an internal revenue tax on cigars exported, or otherwise discourages the industry.

In this connection the following contribution to the *South China Morning Post* of Hongkong by a correspondent who signs his articles D. S. Dady Burjor will be of interest as presenting the view of the resident of Hongkong without all the facts before him:

"Since the publication of my letter in your issue of the 17th April in connection with the cigar making industry in the Philippine Islands, some doubt has been expressed by several expert cigar manufacturers of Manila as to the actual and tangible advantages that will accrue if the cigar factories are established in this free port of Hongkong, and as I have been asked to prove my assertions by a demonstration of concrete and solid facts, I beg leave to return to the subject and discuss it from the various aspects it presents. Broadly speaking, there are five different aspects or standpoints from which the subject can be scrutinized and surveyed, to make it as plain as the mid-day sun even to the meanest intellect that the advantage all points in favor of Hongkong, where the manufacturer is not handicapped by vexatious laws, nor is he over burdened with any Customs imposts with its thousand and one absurd formalities. These aspects are (1) industrial taxations, (2) cost of labor, (3) import duty on materials, (4) export duty on manufactured articles, (5) Chinese Exclusion act.

"As regards the incidence of industrial taxation there does not seem to be any material advantage on the side of Hongkong, as in Manila an annual fee of fifty pesos for corporation license, twenty pesos for manufacturer's license, and a building tax of one and a half per cent on the assessed value of the factory building have to be paid, against the tax of 13 per cent on the assessed rental of the building, and the Crown rent that the Hongkong Government imposes here. Perhaps in this respect Manila and Hongkong run a neck to neck race.

"The cost of labor will most decidedly be cheaper in Hongkong where the teeming millions of industrious, lawabiding, and peaceful Chinese population on the mainland of South China have a free, easy, and welcome access, and where they are given every facility to pursue their peaceful avocations. As I said before the Chinese workman is an apt pupil, and in course of time he will excel his easy going, indolent, and pleasure-loving Filipino rival in the art of making cigars. This is an advantage for free Hongkong which all the ingenuity of the American government will prove impotent to combat or snatch away.

"The import duty imposed on materials to be imported from Europe in Manila gives a decided advantage to the factories established in Hongkong. For high class and expensive cigars for which fancy prices are charged, perhaps this item may not be so serious as it is for cheap cigars and cigarettes in which of late there has sprung up a brisk trade. In order to demonstrate how heavily and injuriously it weighs on the cheap cigarette industry, it may be pointed out that the import duty on one case of cigarettes amounts to pesos 1.26 which represents some 2½ per cent on the selling value of a case. To this has to be added the difference in export duty between the leaf tobacco and the manufactured product, a point to which I am coming presently, and further the advantage of cheap Chinese labor, and one can have no doubt left as to the decided advantage Hongkong has over Manila, and as to how the whole export trade in cheap Manila cigarettes is seriously threatened by the establishment of rival factories in Hongkong and the mainland of South China. It must also be remembered that no skilled labor is required to produce this article, as the handling of the necessary machines is easily learned, and needs no elaborate training.

"Export duty from Manila on raw or leaf tobacco and its manufactures is as follows:—

Customs Tariff.

Article 403. Tobacco, manufactured of all kinds and whatever origin, one hundred kilos (gross weight) 3.00 pesos.

Article 404.—Tobacco raw, grown in the provinces of Cagayan, Isabela and Nueva Vizcaya (Luzon Island) one hundred kilos (gross weight) 3.00 pesos.

Article 405.—Tobacco, raw, grown in the Visayas and Mindanao Island, one hundred kilos (gross weight) 2.00 pesos.

Article 406.—Tobacco, raw, grown in other, provinces of the Archipelago, one hundred kilos (gross weight) 1.50 pesos.

To these duties a wharfage tax amounting to five per cent of the above has further to be added. Now although the Cagayan and Isabela leaf tobacco apparently pays the same export duty as the manufactured product, that is the cigars and cigarettes, in reality the manufactured product pays a far higher rate of duty as it is levied on the gross weight of the packages—that is to say, on cigars and cigarettes and also the weight of the boxes or paper packets in which they are packed. Thus a bale of four quintal (1 quintal = 100 Spanish lbs.) leaf tobacco, weighing gross 192 kilos, and net 185 kilos pays 6.05 pesos export duty, which is equal to 3.27 pesos per 100 kilos on the net weight of the leaf, while a case of ten thousand 14 lbs. cigars weighing net 65 kilos is required to pay 3.43 pesos for duty on its gross weight, which is 109 kilos, thus making it in reality 5.28 pesos per 100 kilos on the net weight of the cigars, against 3.27 pesos per 100 kilos on the net weight of the raw article. Here then is the tariff absurdity revealed, and it portrays before us the edifying sight of a paternal government taxing the manufactured goods of the country under its protecting ægis fully 80 per cent over and above the raw material exported for the benefit of its rivals. But this is not all. This difference between the raw leaf, and the manufactured article becomes still more aggravated and accentuated when it touches the cheap grade cigars, and especially cigarettes in the manufacture of which cheap grades of leaf paying an export duty of only 2.00 pesos and 1.50 pesos per 100 kilos respectively are used. While a case of 1,500 packets of cigarettes pays 2.94 pesos for export duty, the raw tobacco for making the same quantity of cigarettes would pay only 2.16 pesos as per articles 405 and 406, showing a difference of 0.78 cents in favor of the raw article. If to this is added 1.26 pesos paid for import duty on materials as mentioned, it runs up to a total of 2.04 pesos or a saving of fully four per cent in favor of Hongkong, and this not counting the saving effected by cheap Chinese labor. In justice to the American authority in the Philippine Islands be it said that there is a provision made to refund to the manufacturers the import duty paid on materials used in their manufactures and re-exported, but this regulation is so hedged about with grossly absurd stipulations, and difficulties, that it has come to be looked upon more as a huge joke than a provision that is honestly calculated to lighten the burden of taxation on the manufactured goods. According to this provision the Customs authorities reserve to themselves the right to sample, and otherwise test the correctness and validity of the claim before the shipment of the goods, and they further require the exporter, the manufacturer and his foreman to appear at the Custom House and solemnly and sincerely swear to the quantity and value of the materials used, and also to the fact that a certain quantity of such materials was imported as a certain stated parcel. It is of course superfluous for me to add that the manufacturers have ceased trying to apply for this homeopathic dose of relief so mockingly offered to them by the American Government.

"It is hardly necessary for me to dilate at any length on the evil effect the Chinese exclusion act has produced on the industry in the Islands. By having closed the door of entry fast in the face of the Chinese the American Government has deprived the islands of the benefit of cheap labor and driven away several small Chinese factories to Hongkong, Macao and Canton where at present they are doing a thriving trade in cheap cigars and cigarettes.

"Hongkong has therefore nothing absolutely to fear, as until the American Government abolishes the export duty on manufactured goods, and either ceases to collect import duty on materials used in the cigar and cigarette industry, or devises an equitable and easy system of refunding the duty on all materials used on manufactured goods re-exported, the advantages enjoyed by factories established in Hongkong will remain untouched and intact. The Americans are known to be so fondly wedded and hopelessly enslaved to their tariff barriers, that there is very little chance of their ever adopting the truly heroic measures I have enumerated above to contest the advantages a free port like Hongkong has acquired as a natural sequence."

The following is the statement made by Collector Hord at the request of Governor General Smith:

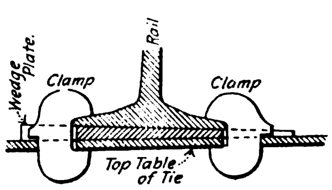
"The Oriente Factory had an output during the calendar year 1905 of 28,429,745 cigars, and during the calendar year 1906 its output was 34,393,174; a total output during the two years of 62,822,919, of which only about 6,904,900 cigars were sold within these Islands for domestic consumption, and the balance of the output, 55,918,019, were exported to foreign countries. This shows an increase in the output of said factory during the calendar year 1906 as compared with the calendar year 1905 of nearly 6,000,000 cigars, equal to an increase of 20 per cent in its 1906 business as compared with its 1905 business. The Internal Revenue Law exempts all cigars exported from these Islands from the tax; the Oriente Factory during the two years exported over 90 per cent of all the cigars it made, and therefore only paid internal revenue tax on less than 10 per cent of its output. The Oriente Factory, in common with all of the cigar factories in these Islands, have added the internal revenue taxes, since they were imposed, on all cigars sold by them, and have received back from the middlemen and merchants an amount equal to, at least, the internal revenue tax paid by them on removal of the cigars from their factories. The situation of the Oriente Factory must, therefore, be stated as follows: since the internal revenue law was enacted they have been absolutely exempt from all tax on over 90% of their output, and have recovered back from the consumers, through the dealers, the internal revenue tax they paid on the remainder.

"Under the old Industrial Tax Law, which the Internal Revenue Law repealed, the Oriente Cigar Factory paid to the City Assessor and Collector of Manila, on March 29, 1905, its last industrial tax payment amounting to ₱4,987.91, that being 5 per cent of the dividends on its business for the last year of the industrial tax. That amount it did not recover back from the consumers nor from the dealers Under the industrial tax law the export business of the factory was not exempt. Under that

WEDGE TYPES OF RAIL FASTENINGS FOR USE WITH STEEL TIES

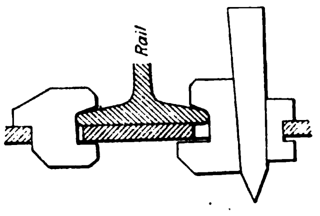
The type of rail fastening most commonly employed in connection with steel ties is a combination of bolts and rail clamps or clips, and this type of fastening has in general proved very satisfactory in service, both in regard to security and to maintenance. The bolts require little attention and show little tendency to become loose, when once brought to a full bearing, although when first applied they have usually to be tightened two or three times. This has been the experience abroad, and so far as we are informed it has been the same in this country. Another type of fastening, which is used to a limited extent abroad, is an adaptation of the screw spike for wooden ties, a short screw being threaded into a plate secured on the inside of the tie, while the head of the screw bears directly upon the edge of the rail base. This latter system appears to be less satisfactory than the other, and in the "Bulletin" of the International Railway Congress for January, 1907, Mr. L. Schlussel, of Paris, France, presents a mathematical analysis of the causes which tend to cause the working loose of screws when used as rail fastenings.

His proposed remedy is to use clamps instead of screws, and while this type of fastening was employed in some of the earliest designs of track construction with steel ties, Mr. Schlussel's application is novel. The general arrangement is shown in Fig. 1, and it will be seen that there is a single clamp on each side of the rail, inserted in an oblong hole and then turned round so that its upper and lower projections bear upon the inside of the tie and the top of the rail flange. The projection at the back keeps the clamp from slipping through the hole while being applied. The pressure or grip of the clamps it set up by means of a wedge-shaped tie-plate beneath the rail. Presumably this is the ordinary European tie-plate, having an inclined face to give an inward inclination to the rail (conforming to the coned tread of the wheels), but instead of being mechanically attached or locked to the tie it is held simply by the friction due to its being driven in so as to set up the pressure between the clamp, the rail and the tie. The function of the wedge plate is to produce this pressure, while the function of the clamp is to maintain the pressure necessary to secure the rail firmly in place.



PROPOSED WEDGE-CLAMP RAIL FASTENING FOR STEEL TIES

I. Schlussel, Paris, France, Inventor.

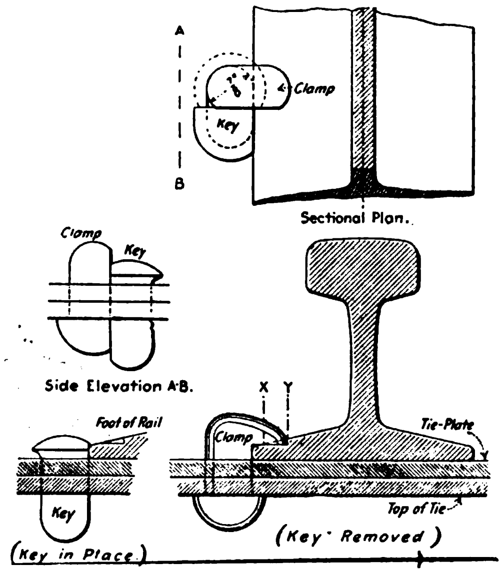


WEDGE-CLAMP RAIL FASTENING USED WITH STEEL TIES IN GERMANY

In this connection we have received a letter from Mr. Albert J. Himes, M. Am. Soc. C. E., Assistant Chief Engineer of the New York, Chicago and St. Louis Ry., at Cleveland, O., commenting upon the Schlussel system and describing another form of wedged-clamp fastening designed by him some years ago. It embodies the same principles, and the main difference is that in order to produce the pressure it employs (instead of the wedge-plate under the rail) a horizontal lip or projection on the upper end of the clamp which will be distorted when forced upward on the rail base, as at X-Y in Fig. 2. The clamp is secured in position by a vertical key inserted in the same hole in the tie. Mr. Himes suggests that much study will be required to perfect a fastening that will be to track with steel ties what the spike has been to track with wooden ties, and he considers that some fastening of the sort proposed by him would be found much more economical and satisfactory for use with steel ties than the threaded bolts with washers and nuts which are now being used. One objection that appears evident, however, is the possibility of causing cracks at the holes in the ties, due to the strain and shock incident to the distortion of the clamp when being tightened upon the rail. However, experience alone can prove or disprove the merits in a case of this kind.

As already noted, the wedge and clamp system of fastening has been used with steel ties from a very early date, and in Fig. 3 is shown a fastening of this kind which dates from 1867 and was at one time extensively employed in Germany and elsewhere. The clamps are somewhat similar to those of Mr. Schlussel, but with the back vertical, forming the bearing for a vertical gib or taper key. In the original design, the key was simply driven between the rail clamp and the metal of the tie, but the keys would work loose, causing considerable noise from the rattling of the parts, while the driving of the key and the vibration and shock under traffic frequently resulted in starting cracks in the tie at the holes for the fastenings. An additional clamp was therefore used, as shown, to give a larger bearing to the back of the key and also to relieve the metal at the hole from the direct action of the key. As thus modified it was found to give satisfaction and was used for 25 years and more, but the wedge type of fastening has now given place very largely to the bolted clamp type. It will be seen that each fastening consisted of four parts, as compared with three in Mr. Schlussel's proposed design. The adjustment of gage was effected by using clamps of varying widths.

Another fastening of the wedge type which has been very extensively used abroad within recent years, more especially in India, consists of a horizontal key wedge fitted between the edge of the rail base and a projection on the tie. The key is grooved to bear on the top and side of the rail base, and is driven longitudinally with the rail. The projection against which it bears is either stamped out from the face of the tie, or is a separate piece; in the latter case it may be either riveted in place or loosely fitted to a hole in the tie.—*Engineering News.*



VERTICAL SECTIONS
PROPOSED WEDGE-CLAM RAIL FASTENING FOR STEEL TIES

Albert J. Himes, Cleveland, O., Inventor.

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law corporations paid the 5 per cent tax on profits, and concerns that were not incorporated paid at the rate of two pesos per annum for each cigar maker they employed. The new internal revenue law imposes no tax on cigar makers.

"The increase in the business of the Oriente Factory in 1906 as compared with 1905 shows that their business has not been ruined, nor is there any danger whatsoever of their being driven out of these Islands by the internal revenue tax. The Oriente Factory may be establishing a branch factory at Hongkong for the purpose of getting cheap labor, inasmuch as hand labor is the biggest factor in the production of cigars, but the owners of the Oriente factory have no intention of abandoning the Manila concern. On the contrary, they filed on January 25, 1907, in this office a bond, No. A-5-235, in order to qualify as manufacturers of cigarettes, an industry in which they had not hitherto engaged, or at least were not engaged when the internal revenue law was enacted. They have installed in said factory three German machines with a capacity of 150,000 cigarettes in 24 hours. They estimate their production for the current calendar year at 38,000,000 cigarettes.

"In view of these facts it is recommended that the wild statement attributed to Mr. Ingenohl in this interview be not given serious attention. Mr. Ingenohl, at the time the internal revenue law was enacted, and for a few months after that date, was a member of the Executive Committee of the Tobacco Interests of the Philippines, but he resigned from said committee about two years ago. Mr. Robles Lahesa, attorney for said committees, informed the Collector of Internal Revenue at that time that Mr. Ingenohl was too radical to get along with the other members of the committee, or words to that effect. If Mr. Ingenohl is going into the business of making cigars in China, it is because hand labor is cheap in that country, and if he is now engaged in the manufacture of cigarettes in these Islands it is because the cigarette machine practically eliminates the labor item; and in either event the internal revenue law of these Islands had no influence whatever in encouraging or discouraging either of the two new enterprises in which its prosperity makes it possible for the Oriente Factory to engage."

ENGINES AND BOILERS FOR SALE

Attention is called to the advertisement in another column of the Manila Navigation and Transportation Service in which the company offers for sale several engines and boilers to the trade.

OBITUARY

Mr. Patrick Doyle, the veteran editor and proprietor of the *Indian Engineering*, one of the leading magazines in the far east, passed away in Bombay while on his way to England to recuperate his failing strength. Mr. Doyle had been ill for many months, but none of his friends believed the symptoms alarming so that the news of his death came as a painful surprise.

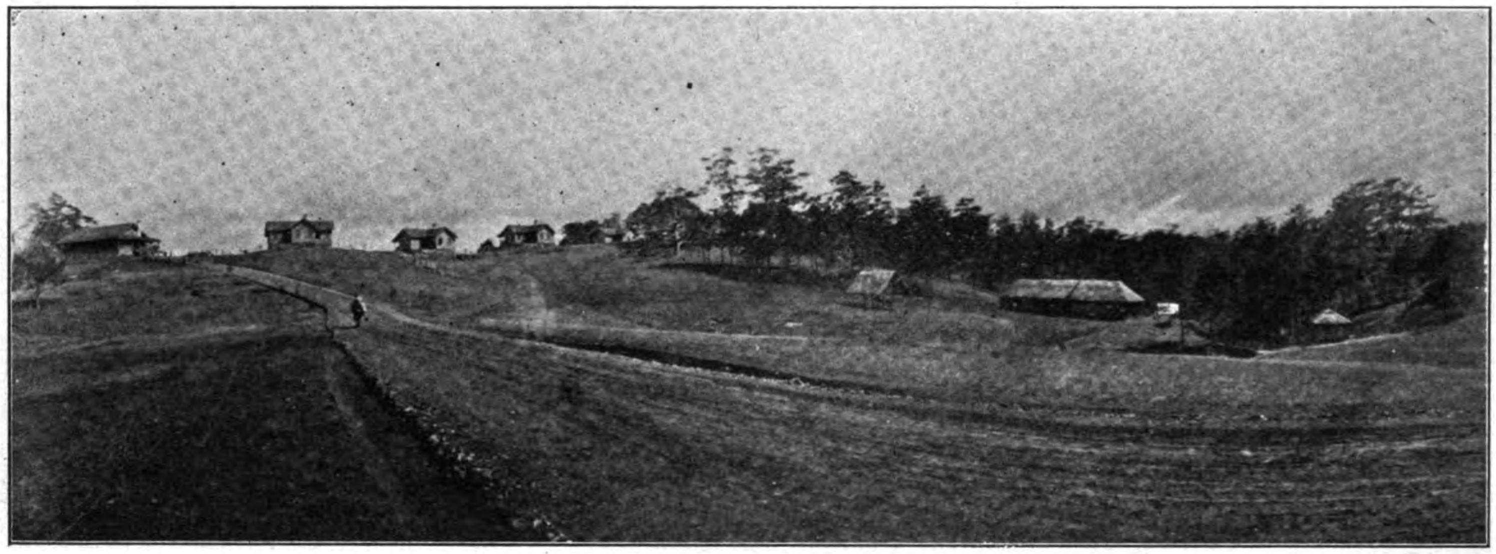
BAGUIO, THE SIMLA OF THE PHILIPPINES

(Continued from page 371.)

critics as the best investment made by the Philippine government.

When referring to the difference in climate between Manila and Baguio it is not unusual for the American to point out the fact that it is but 21 miles from the torrid to the temperate zone in the Philippines. While this may not be true geographically it is an undisputed fact that the distance named will provide the torrid climate at Camp One and the temperate climate at Baguio. Between these two points there is an elevation of about 5,000 feet. The average temperature at Baguio the year round is about 75 maximum and 51 minimum. In December and January the thermometer sometimes drops to the freezing point and there are few evenings when a fire is not welcome. So the islanders may now easily escape from the enervating climate of the lowlands to the invigorating climate of the hills and find every accommodation for their comfort while convalescing.

Among the most substantial buildings erected in Baguio is that of Commissioner W. Cameron Forbes at a point called Topside. The residence cost ₱50,000 and is built of Benguet rock. A residence for the governor general is now being constructed at a cost of ₱30,000. The first story is of Benguet stone and the second of native wood. The commission recently appropriated 50,000 pesos for a sanitarium, while the military and the naval authorities have provided for a sanitarium each on a much larger scale. These institutions, while open to the hill people for treatment, are being established as convalescent hospitals. The civil sanitarium will be made available not only to government employees but to all who seek treatment there. The proposed naval hospital will be operated in conjunction with the large naval hospital at Canacao, Cavite, and all patients will be sent to the hills while in the convalescent stage.



CAMP JOHN HAY, BAGUIO, BENGUET

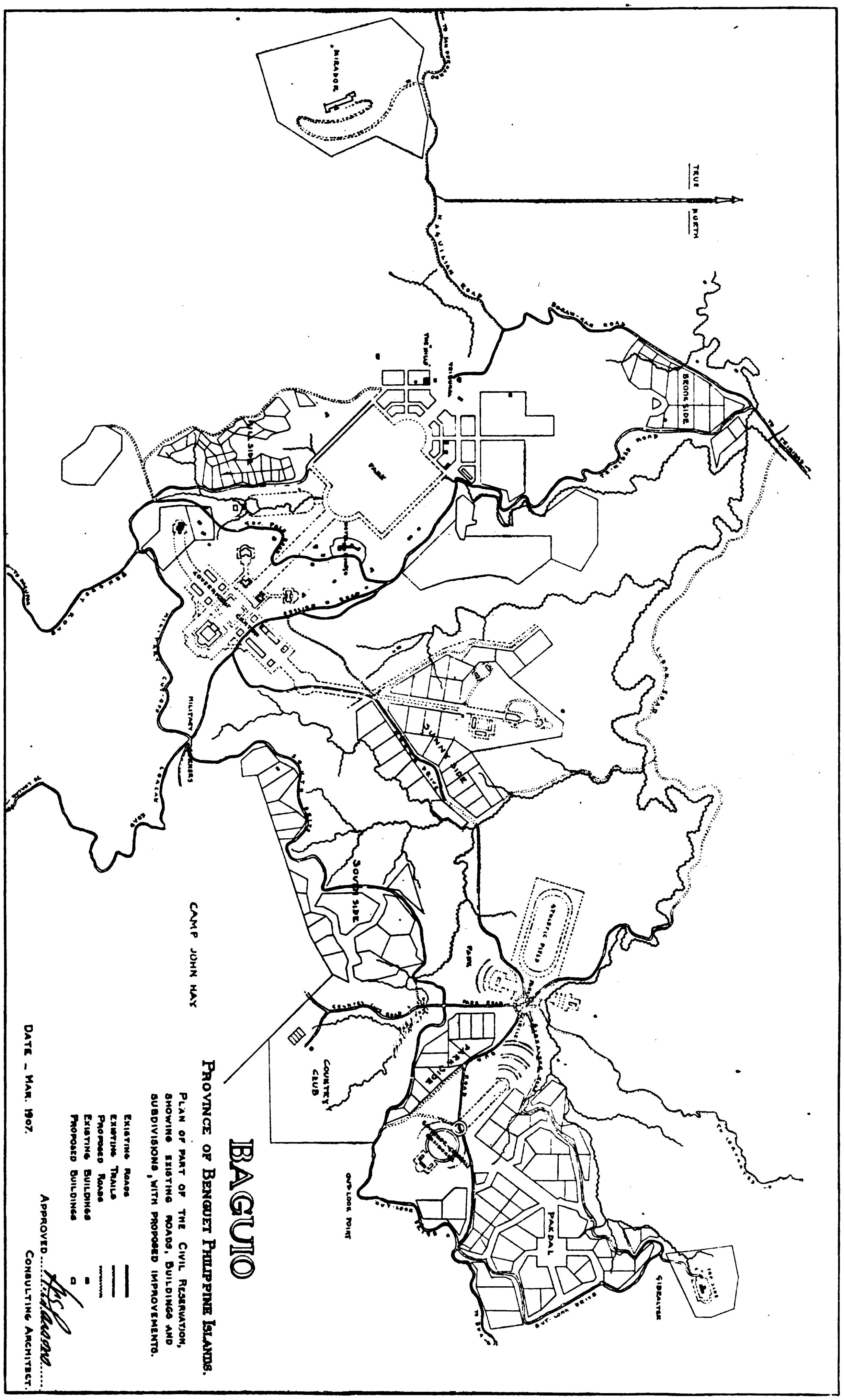
At the present time Camp Hay is filled to overflowing with army officers and enlisted men who are recuperating their strength after hard service in the field or who have been exposed continually during their service here to the enervating climate. General Wood believes that by increasing Camp Hay to the size of a brigade post the tour of duty in the Philippines could be extended by giving every organization a chance to enjoy the benefits of the Benguet climate, for recuperation purposes alone. In this way a great saving in transportation would be made in the war department's appropriations for transportation to and from the Philippines. With the completion of a railroad into Baguio it is not improbable that this recommendation will meet with favorable action at Washington.

At Mirador, the Jesuits have selected a site for a monastery and observatory. This point is situated on the west side of the reservation and commands a view of the China sea over forty miles distant. It is an ideal spot for an observatory and it is the purpose of the order to equip the institution to the standard of their world renowed observatorium in Manila.

In addition to the private and government institutions the different religious organizations are establishing headquarters at Baguio with schools and seminaries for the Igorots and Americans and foreigners. Among these proposed institutions is a boys' school for white children to be conducted by the Episcopal mission. The object is to give foreign and

WHERE THE ROAD TO CAMP JOHN HAY, BAGUIO, BRANCHES OFF FROM SESSION ROAD

(Continued to page 378.)


BAGUIO
PROVINCE OF BENGUET PHILIPPINE ISLANDS.
PLAN OF PART OF THE CIVIL RESERVATION,
SHOWING EXISTING ROADS, BUILDINGS AND
SUBDIVISIONS, WITH PROPOSED IMPROVEMENTS.
EXISTING ROADS
EXISTING TRAILS
PROPOSED ROADS
EXISTING BUILDINGS
PROPOSED BUILDINGS
DATE – MAR. 1907.
APPROVED
CONSULTING ARCHITECT.
CAMP JOHN HAY
TRUE NORTH
MIRADOR
BROOKSIDE
SUNNY SIDE
SOUTH SIDE
COUNTRY CLUB
PACDAL
GIBRALTAR
OUT LOOK POINT
PARK

BAGUIO, THE SIMLA OF THE PHILIPPINES

(Continued from page 376.)

American children the benefit of an education in a climate as nearly similar as possible to the temperate zone.

The nucleus of the population of Baguio consists of the official family who have residences there, the military officers on duty at Camp Hay, the businessmen who have cast their lot in the mountain region and the now growing group of mining men who are developing the mineral wealth of the province. It is estimated that over 100 oz. of gold are brought out each month which is realized from the workings of three mines. More machinery is coming in monthly and the future of the mining industry of that region is most promising.

The forests of pine provide all the necessary timber for building purposes and firewood, and a saw mill has been in operation for several years. Mr. Whitmarsh, manager for the Benguet Commercial Co., is distinguished as the oldest settler and his beautiful home is the center of attraction to all pilgrims to the mountain region. In the well arranged grounds surrounding his residence may be found the rose and the pine flourishing side by side as they do in the mountains of California and it might be said that of no other tropical section of the far east may this be said.

The residents and the officials have taken a great interest in encouraging outdoor recreation and have organized The Country Club for this purpose. The grounds were cleared and the grass and rubbish burned off early this season so that next season they will be in first class condition. A nine hole golf course has been laid out and when the rainy season is over and the grass grows these links will not be excelled by any course in the far east in the matter of altitude or natural beauty. Besides the links, tennis courts, polo grounds and a diamond for base ball have been laid out, while a gun club has provided all the equipment for trap shooting. It is the purpose of the club to make available to all visitors to Baguio every facility of indulging in every form of healthy recreation in a climate so well adapted to outdoor sport.

Temperate zone fruits and vegetables are available for the table at all seasons of the year. Strawberries are not only available during the summer months but are grown in the open all the months of the year.

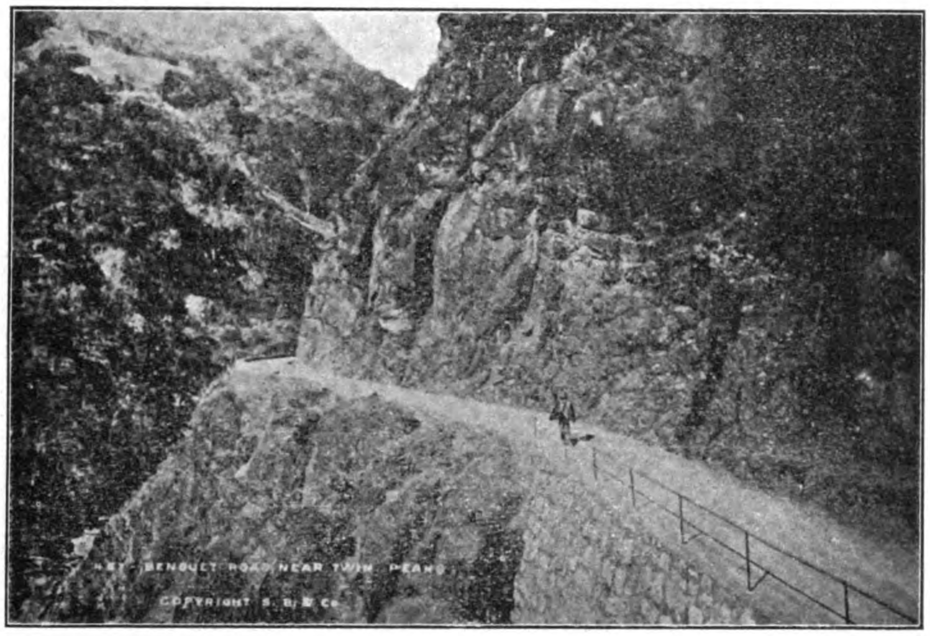
The development of Baguio is in its first stage but there is every reason to believe that, with better transportation facilities the country thereabouts will develop rapidly and with it the summer capital. Its value as a health resort cannot be estimated. Not only will it offer a place for recuperation equal to any resort abroad but it will keep the money hitherto spent in foreign parts in circulation in the Philippine islands.

The archbishop's residence, commanding a view of the Benguet road and the Baguio valley and within easy distance of the government center has been completed at a cost of about 10,000 pesos.

The Methodist Home, costing approximately 5,000 pesos, is also ready for occupancy, while the addition to the Hotel Pines has been occupied as bachelor quarters and cost about 5,000 pesos to complete.

The governor general's residence, the contract price of which is about 30,000 pesos, is now under way and the work is progressing as well as could be expected. Messrs. Campbell & Co. have overcome many natural obstacles with difficulty owing to the lack of proper facilities for transportation. The residence is being built on a delightful elevation overlooking Look-Out Point and to the northeast of the Country Club. The transportation of materials was overcome by a steam winch and gravitation. Especially difficult was the handling of the rock for the foundation and the first story.

Messrs. Campbell & Co. have installed a saw mill at Baguio for the supply of all the native lumber used in their contracts. The firm is looking forward to an unusual building boom before the season closes and orders for estimates are increasing, especially for residences to be built next season. Altogether the progress made in the development of Baguio since the completion of the road has been remarkable and the prospects for the future exceed the most sanguine expectations of the promoters of the hill city.



STRIKING PORTION OF THE BENGUET ROAD HEWN OUT OF THE SIDE OF THE MOUNTAIN OF SOLID ROCK

O. F. CAMPBELL & CO., CONTRACTORS

The work of construction of the buildings being erected at Baguio is being largely carried on by Messrs. O. F. Campbell & Co., the well known firm of Manila contractors. In all, the contracts for this season amounted in value to over 50,000 pesos and most of this work is completed, while a number of contracts for residences have been closed and construction will begin at once.

SUBURBAN RAILWAY CO.

The Suburban Railway Co. is continuing the construction of its line from Manila to the Mariquina valley. The Fort McKinley section, which was opened April 17, is doing an enormous passenger traffic, and as the line is opened up beyond the fort this will be greatly increased. The construction of the bridge at Pasig over the Pasig river has been delayed, as the steel has not yet arrived. The surveying and grading continue so that when the bridge is in place there will be no delay in laying the steel and putting the road in shape for operation.

DELIGHTFUL SWIMMING POOL AT TWIN PEAKS, THE HALFWAY ON THE BENGUET ROAD

WHANGPOO CONSERVANCY CONTRACTS

In connection with the Whangpoo Conservancy Contracts, the Shanghai *Times* of recent date presents the plans and a description of the important work as undertaken by the convention, with the bids submitted for its completion. The *Times* says in part:

We have been favored with a complete set of papers, plans, calculations, tenders, etc., connected with this most important work. Before us there lie two complete specifications, together with the forms of agreement used in connection therewith, eight large blueprint sheets of engineering drawings showing precisely how the work proposed is to be carried out, a detailed map of the works in question showing the river from Gough Island to the Yangtse, and finally the form of tender together with the actual figures of the tenderers.

Specification No. 1 is divided into five portions: No. 1. Showing Plan of Training Works, Woosung Outer Bar. No. 2. Cross Sections of Jetty. No. 3. Details of Work Staging for Jetty. No. 4. Training Dyke at Prince's Wharf, Sea Dyke and Harbor Bunding. No. 5. End of Jetty and Details of a Crib.

There is a Jetty with a Crib, a Training work at Prince's Wharf, a Sea-dyke across over the spit and a bunding for the proposed Work harbor. For the purpose of this work Low Water level is reckoned from the new Datum-level which is two feet higher than the Zero line at the Woosung Inner Bar Signal Station.

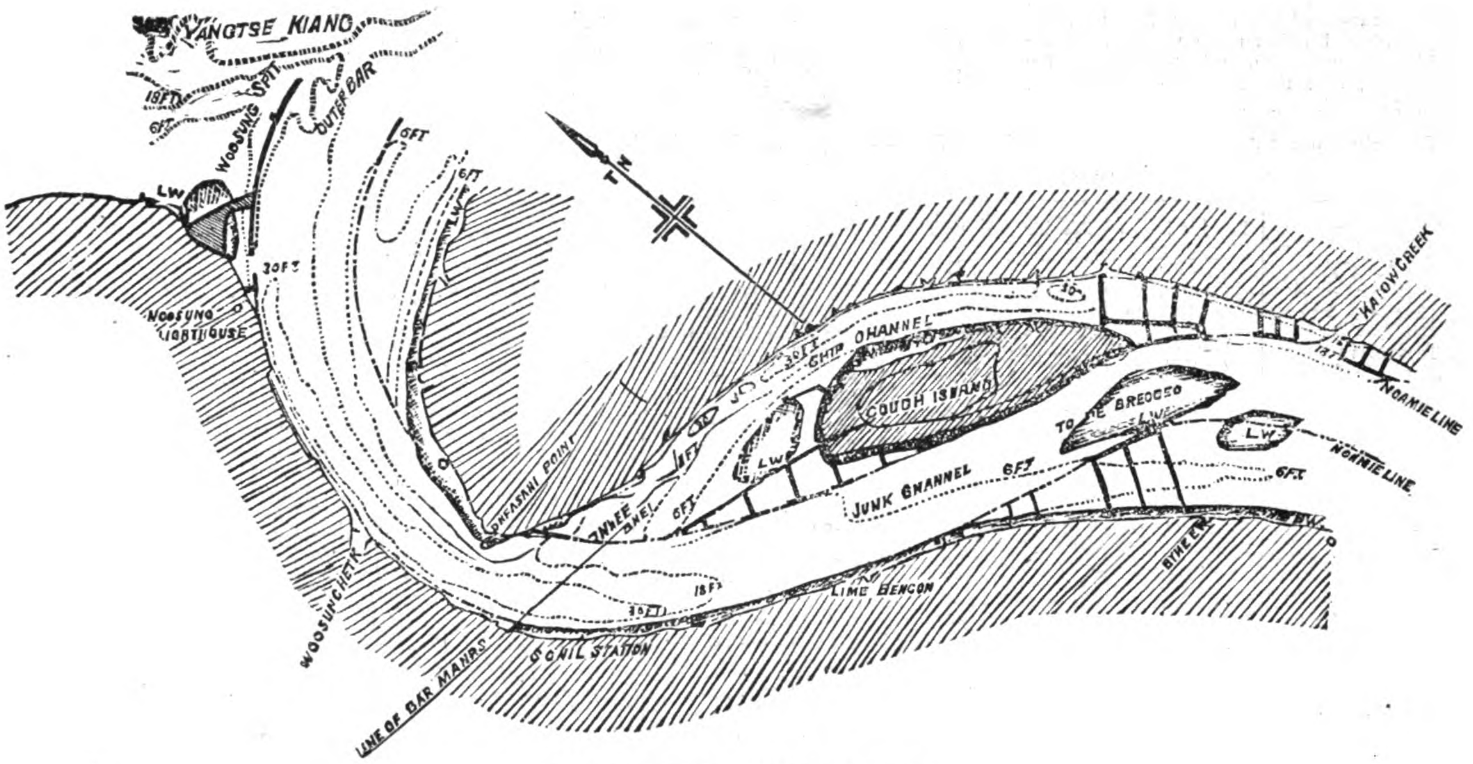
Then follow instructions as to the material, to be employed. The "Wieps," for examples are to be ropes of brushwood, hard, tough, pliable and well branched, not thicker at the butt than 2½ in., and so on. These "Wieps," it is stipulated, shall at the time of use have tensile strength to stand the strain of six strong coolies pulling against another six. The next technical term we come to is "Zinkstuk," and this is defined as two gratings of "Wieps," one at the bottom and one at the top with a filling of brushwood between them. Precise instructions as to their construction are given in the specification. So with ballast stone, stone for the rubble mounds, for concrete and so on. Space forbids us from following the specification all through the careful details respecting gabions, piles, cement work concrete and the like. It is enough to say that everything seems to have been carefully considered down to the minutest detail.

The training work at Prince's wharf will be 600 ft. in length and 15 ft. wide, while the sea-dyke across the spit will be 1710 ft. long. This is intended to form a protection against wave-action round the Work-harbor, and therefore consists of a strong sea slope crowned by a sea-wall 17 ft. about low water. The building for the work harbor will be 540 yards long. The order in which the various portions of this specification are to be carried out are: 1. The completion of the jetty with crib, and of the training dyke. 2. The completion of the crib mentioned in section 32 and 3. The completion of the work harbor bunding. Prices per unit of work are given in detail.

Specification No. 2.

The work to be done under this specification consists of: 1. The dredging of a work harbor projected near Woosung Fort as shown on the plan. 2. The execution of dredging work in the Whangpoo between the Point Hotel and the confluence with the Yangtse River. 3. The depositing of the matter dredged at places to be pointed out.

The remainder of specification deals entirely with detailed discussion or instruction as to the manner in which the work may be performed.



WHANGPOO RIVER IMPROVEMENTS

Agreement No. I.—The first thing of importance is that the work shall be completed to the satisfaction of the Engineer in Chief in 36 months. The contractor shall be bound over in a certain sum and shall have a guarantor, work to be commenced within three months after the signing of the agreement, no work (except of necessity) being done on Sundays or Customs' holidays. Strict regulations are laid down as to quality of material, as to fines, payment and so on. The guaranty under this agreement is fixed at Tls. 60,000.

Agreement No. II.—It is similar in tenor to the foregoing but the amount of guaranty is fixed at Tls. 100,000.

THE WORK AS A WHOLE.

The foregoing is sufficient to show the sort of demands made upon the contractors by Mr. de Rijke, together with the manner in which their duties are to be performed. But to understand the subject as a whole it will be necessary to consult the map herewith and follow carefully the following description. Beginning, then on the Gough Is. side of the map it will be seen that there is traced a magnificent curve from the Gough I. side of the junk channel round through Pheasant

Point well out beyond a point opposite the Woosung Lighthouse. It must be remembered in connection with this line that the Junk Channel is to be dredged until it has sufficient water for any ships that come to Shanghai, and that when this is done the present ship channel is to be closed entirely. We have said that the line of the curve goes through Pheasant Point. That is correct, for the point is to be dredged away sufficiently for that purpose.

Turning now to the other (the Woosung) side, the line follows the present bank very closely indeed, and it is not till we come close to the Woosung Lighthouse that any new departure of importance begins. Here comes the beginning of the work for the new work harbor where, as stated above, there is 540 yards of bunding to be done followed by the sea-dyke across the spit to the length of 1710 ft.

There is every promise, if this work is done according to the plans before us, of a permanent improvement in the mouth of the river, an improvement which cannot fail to have a most beneficial effect upon the trade of the port. The curves are admirably drawn for their purpose, and the results should be all that can be wished for.

The prices named in the bids would indicate that the German company made the lowest offer for the dredging work, while the Japanese company is the keenest competitor for the embankment work. The following are the sums total for the complete contract as estimated by the *Shogyo Shimpo*, a Japanese paper, in commenting on the bids offered:

Cost of Embankment.	Taels.	Cost of dredging per 100 cubic yards. Taels.
Dutch contractors	2,138.000	42
German contractors	1,615.000	20
French contractors	1,697.000	—
Japanese contractors (Messrs. Okura and Company)	1,500.000	13.25

The operations can not, however, be separated, since the material obtained by dredging has to be used for embanking, so that there is a standstill, unless the same contractors get the two jobs.

The following are the bids submitted by the different contracting firms in detail:—

Details of Tenders.

Tenderers	Tender No. 1	Tender No. 2	Tender No. 3	Tender No. 4	Tender No. 5
	Woosung Outerbar Training works. Sh. Tls.	Dredging work one million Taels Sh. Tls. per 100 c. y.*	Dredging work two million Taels Sh. Tls. per 100 c. y.	Woosung Outerbar Training works (Sh. Tls.) † Dredging one million Sh. Tls. per 100 c. y.	Woosung Outerbar Training works (Sh. Tls.) † Dredging two million Sh. Tls. per 100 c. y.
Vering & Co. (German)	1,615,000	a.* —— 20 b. —— 22 c —— d. ——	a. —— 16 b. —— 16 c. —— d. ——	1,615,000 a. —— 20 b. —— 22 c. —— d. ——	1,615,000 a. —— 16 b. —— 18 c. —— d. ——
Galampoix (French)	1,697,261 conditionally (not à forfait)	——	——	——	——
Okura & Co. (Japanese)	——	——	——	1,500,000 a. —— 31,25 b. —— 31,25 c. —— 31,25 d. ——	——
Ten Bokkel Huinink, Korthals Altes and van Thiel de Vries. (Dutch)	2,187,798	a. —— 43 b. —— 47 c. —— d. ——	a. —— 29 b. —— 33 c. —— d. ——	2,137,798 a. —— 42 b. —— 46 c. —— d. ——	1,997,798 a. —— 28 b. —— 32 c. —— d. ——

* a, b, c, d. These letters refer to four divisions of the work as detailed.

THE RUSSO-JAPANESE JOINT STOCK TRADING COMPANY

Some interesting particulars are given in the *Journal* of the American Asiatic Association concerning the Russo-Japanese Joint Stock Trading Company. The organization of this company is complete on the Russian side, owing to the efforts of M. Minkofsky, honorary consul for Japan, and the well-known Baron Ginsburg. The Japanese organization remains to be completed, but Mr. Shimomura is making strenuous efforts, which are expected to be soon crowned with success. He has obtained the co-operation of 67 leading Japanese merchants, who agreed to send Japanese products and manufactures for furnishing a bazaar in St. Petersburg. Meanwhile, M. Minkofsky had succeeded in forming an association with a capital of 1,000,000 roubles in 4,000 shares of 250 roubles each, its object being to promote the mutual exchange of commodities between the two nations. This company contemplates the establishment of Russo-Japanese stores in all the principal Russian marts, European and Asiatic alike, and possibly the ultimate establishment of a Russo-Japanese bank, should the development of the project call for such a measure. Mr. Shimomura is now working to form a corresponding company in Japan, and it is said that he has already secured the co-operation of many leading men of business.—*Japan Advertiser.*

LATE PUBLICATIONS

The Philippine Journal of Science for April contains several interesting articles as follows: Clarke, C. B. Cyperaceæ of the Philippines: A list of the Species in the Kew Herbarium; Merrill, Elmer D. The Occurrence of Antiaris in the Philippines; Massee, George. Philippine Myxogastres; Christ, H. Cibotium Baranetz J. Sm., and Related Forms; Copeland, Edwin Bingham. Pteridophyta Halconenses: A list of the Ferns and Fern-Allies Collected by Elmer D. Merrill on Mount Halcon, Mindoro.

Modern Steam Engineering in Theory and Practice, by Gardner D. Hiscox, M.E., with several chapters on Electrical Engineering by Newton Harrison, E. E., has recently been issued by the Norman W. Henley Publishing Co., New York. This volume contains the latest information on steam engineering and devotes a large portion of space to economy and the application of steam power to the generation of electricity. The chapters devoted to electric engineering are of unusual interest. The volume contains over 400 illustrations. Cloth $3.00.

Modern American Lathe Practice, by Oscar E. Perrigo, M. E., a complete and valuable work on this important factor in the equipment of the machine shop, has been issued from the presses of the Norman Henley Publishing Co. New York. Cloth, $2.50.

McCluskie's Indian Directory and Guide for 1907, the successsor of the Calcutta Directory and Guide, is one of the most complete compilations of information about India that has ever been issued from Calcutta. The publishers have taken the greatest care in revision and many new featutres of the greatest value to the publication have been added. The directory was compiled by E. T. McCluskie and published by the Baptist Mission Press, Calcutta. Price Rs. 8.

The Asylum Press Almanac and Directory of Madras and South India for 1907.—This valuable publication is in its 106th edition and excels in point of careful compilation and increase of scope, all previous issues. It will be found of the greatest value as a source of accurate information about South India and Madras.

NEW RUBBER COMPANIES

Subscriptions were invited on 21st inst. for 50,000 shares of the Sumatra Para Rubber plantations company, which has been formed, with a capital of £100,000, to acquire the Pangkattan Estate, on the east coast of the Island of Sumatra. The property is held under lease for 75 years from December, 1900, at a nominal rent of about 8d. per acre, and has an area of about 5,000 acres. It is stated that there are 72,500 rubber trees on the estate, of which about 30,000 have been planted since 1904. The crop of dry rubber for 1906 was 13,420 lbs., of which 7,904 lbs. was sold at an average of 5s. 4¾d. per lb., while the coffee crop realized £3,045. The output of rubber ought to be very largely increased during the current and subsequent years, and Mr. Thomas Boyd thinks that the lowest valuation that can be put on the estate is £90,000. The purchase price, however, has been fixed at £60,000, payable as to £40,000 in cash and £20,000 in shares, and the intermediary vendors apparently are not making any profit out of the transaction, their only remuneration being an option to acquire 20,000 of the unissued shares at par up till March 31, 1910. The applications for shares were so numerous that the lists were closed the same day.

The Kuang (Selangor) Rubber Company has been registered with a capital of £20,000 in £1 shares. To adopt an agreement with W. de Leighton Brooke for the purchase of 1,000 acres of land, near the forest reserve on the Kuang Penghalan Kundang road, in the district of Ulu Selangor, State of Selangor. No initial public issue. First directors (not less than three nor more than seven): R. Whitehead, G. E. Wike, O. W. Porritt, J. R. Crompton, and W. de Leighton Brooke. Qualification, £100. Remuneration as fixed by the company. Offices: 32a, Brown-street Manchester.—*Singapore Free Press.*

FAR EASTERN COMPANY REPORTS

MERCANTILE BANK OF INDIA

The Manager of the Mercantile Bank of India, Ltd., Calcutta, has received a telegram stating that the result of the last year's working of the Bank shows a net profit, including amount brought forward from the previous year of £90,801. The Directors will recommend at the yearly meeting a dividend on both "A" & "B" Shares of 3½ per cent, making, with the interim dividend declared to 30th June last, 6 per cent for the year. The Reserve Fund is to get £35,000, and the Officers' Pension Fund £2,000, leaving a balance of about £20,000 to be carried forward.

NATIONAL BANK OF INDIA

The report of the National Bank of India (Limited) for the year ended Dec. 31 shows a net profit of £192,600, and adding £69,065 brought forward, the available total is £261,665. An interim dividend at the rate of 12 per cent per annum, tax free, was paid for the half-year ended June 30, and £25,000 was added to reserve. The directors now recommend a further dividend at the same rate and an addition of £25,000 further to the reserve fund, raising it to £600,000, thus making it equal to the paid-up capital. They propose to write £10,000 off house property account and to add £7,500 to the officers' pension fund, leaving a balance of £122,165 to be carried forward.

THE MERCANTILE BANK OF INDIA, LIMITED

The net profits of the Mercantile Bank of India for the year ending 31st December last, including the amount brought forward, are £90,801. The Directors recommend paying a dividend at the rate of 3½ per cent (making 6 per cent for the year free of Income Tax) placing to Reserve Fund £35,000, to Officers' Pension Fund £2,000 and carrying forward £20,000.

HUNAN STEAMSHIP CO.

A general meeting of the shareholders of the Hunan Steamship Company was held at the Tokyo Bankers' Association on March 30 at 2 p. m., when a dividend for the second half of last year was declared at the rate of 6 per cent per annum.

BANK OF FORMOSA

The Bank of Formosa held the general meeting of its shareholders at the Bankers' Club, Tokio, for the year 1906. The following business report was then adopted:—

	Yen
Profit	247,503.399
Brought from previous account	59,568.130
Total	307,101.559
To reserve against loss	50,000.000
To dividend equalization fund	10,000.000
To special reserve	30,000.000
To bonus	15,000.000
To dividend (10 per cent per annum)	125,000.000
Carried forward	77,101.559

CHARTERED BANK

The Chartered Bank of India, Australia and China has announced a dividend of 13% for the year ending December 31, 1906. The directors have recommended an increase of capital to £1,000,000, £25,000 to be written off; £100,000 to be carried to the reserve fund and £93,000 carried forward as undivided profits. Of the new stock £200,000 will be offered to the shareholders at £40.

BANGKOK DOCK CO., LIMITED

At the annual meeting of the Bangkok Dock Co., Limited) a dividend of 12½% was declared and a bonus of 2½% directed paid the shareholders.

SHANGHAI AND HONGKONG WHARF CO , LIMITED

At the annual meeting of the shareholders of the Shanghai and Hongkew Dock Co. a dividend of Tls10 a share was authorized for the year 1906.

THE YANGTSZE WHARF AND GODOWN CO.

At the annual meeting of the Yangtsze Wharf and Godown Co. held at the company's offices Shanghai, March 30, a dividend of 18% was authorized for the year 1906.

THE CHINA LAND AND FINANCE CO., LTD.

The fourth annual general meeting of shareholders in the China Land and Finance Co., Ld., was held at No. 13A Canton Road, Shanghai, March 27. Mr. R. Macgregor was in the chair, and shareholders were present representing 6,340 shares. The report and accounts as presented were accepted and passed; the appointment of Mr. King Chun-kee as a director was confirmed. Mr. R. Macgregor was re-eleted a director, and Mr. A. R. Leake auditor of the Company; and it was resolved to pay a dividend of 10 per cent on capital (absorbing Tls. 32,125), to place Tls. 10,000 to Reserve account, and to carry forward Tls. 4,393.30 to new account.

WATKINS & CO., LIMITED

The annual meeting of Messrs. Watkins, Limited, Hongkong, was held on March 30th. Mr. G. A. Watkins was in the chair and there were also present Messrs. A. R. Lowe, Chow Hon Wah and Chan A Fook. In his speech the Chairman referred to the lean year experienced and pointed out that substantial amounts had been written off assets. During the year a profit of $9,596.10 had been made; salaries and wages have been reduced by $5,000; charges account by $5,000; and sterling liabilities were $6,000 less than last year. The Chairman was sorry he could not pronounce that dividend warrants would be issued. The next annual meeting would take place in May instead of March. The report and accounts were adopted.

YANGTSZE INSURANCE ASSOCIATION

At the general meeting of the shareholders of the Yangtsze Insurance Association held April 26th the Directors recommended the payment of a dividend of 20 per cent, and the placing of $50,000 to the credit of reserve fund.

CHINA IMPORT AND EXPORT LUMBER CO., LTD.

At the last annual meeting of the shareholders in the China Import and Export Lumber Co., Ltd., a dividend of 10% was declared, $20,000 transferred to Reserve Fund; and $17,210, carried forward to this year; after paying all expenses.

CHINA-BORNEO CO., LTD.

The following is the report presented to the shareholders of the China-Borneo Company, Ltd., at the fourth ordinary yearly meeting held on Saturday, 27th April:—

The General Manager and Consulting Committee beg to present to the shareholders the fourth ordinary yearly report of the Company. The accounts show a profit of $12,028.64. The Consulting Committee recommend:—To write off Launches and Lighters, $5,000; to write off Kudat Pier, $2,000; to write off House Property, $1,500; to write off Talaga Saw Mill, cost of removal, $720; and to write off Timber Concessions, $2,808.64—$12,028,64.

TOKIO MARINE INSURANCE CO.

The annual report of the Tokio Marine Insurance Co., Ltd., states that the balance in hand at the beginning of the year was 3,650,689 yen. The revenue amounted to 1,692,456 yen, the claims and losses to 315,159 and the expenses to 195,403 yen. There remained a balance of 1,181,893 yen to which had to be added 369,568 yen. A dividend at the rate of 24 per cent was declared, and a total balance of 3,090,158 carried forward. The local agents of the Company are the Mitsui Bussan Kaisha.

CHINESE ENGINEERING AND MINING CO.

The following is the report of the China-Borneo Company (Ltd.) submitted April 27:

Gentlemen:—The General Manager and consulting committee beg to present to the shareholders the fourth ordinary yearly report of the company. The accounts show a profit of $12,028.64.

The Consulting Committee Recommend:—To write off Launches and Lighters $5,000.00; To write off Kudat Pier $2,000.00; To write off House Property $1,500.00; To write off Talaga Saw Mill, Cost of Removal $720.00; To write off Timber Concessions $2,808.64; Total $12,028.64.

THE SHANGHAI TUG AND LIGHTER CO., LTD.

Report of the directors for the year ending 31st December, 1906:

The Directors herewith submit a statement of the audited Accounts for the year ending 31st December, 1906, showing at the credit of Profit and Loss Account the sum of Tls. 60,-827.06, after the payment on the 4th August, 1906, of an Interim dividend of 3½ per cent on Preference Shares, Tls. 17,500.00 and 5 per cent on Ordinary Shares, Tls. 50,000.00.

This sum of Tls. 60,827.06 now remains for appropriation and the Directors recommend that it be distributed as follows:

	Tls.
To a Final Dividen of 3½% on 10,000 Preference Shares	17,500.00
,, a Final Dividend of 3% on 20,000 Ordinary Shares	30,000.00
,, be carried forward	13,327.06
	60,827.06

THE CHINA LIGHT AND POWER CO., LTD.

The following is the report that has been presented to the shareholders of the China Light and Power Company, Limited, Hongkong, at the Sixth Ordinary General Meeting held at the Office of the General Managers Wednesday, April 17, at 11 o'clock a. m.

Annexed we have the pleasure to lay before shareholders a statement of accounts for the year ending February 28, 1907. The gross profit amounts to $79,966.66, and the net profit including the amount brought forward from last year, and after payment of interest and other charges amounts to $46,459.10 which it is proposed, be written off as depreciation. The result is an improvement upon the previous year but our income at Canton was seriously reduced by fires in the months of October and November which burnt out a number of our customers. The high price of coal and the heavy loss in exchange on small coins in which most of our accounts are paid, have also adversely affected our profits.

SHANGHAI PULP AND PAPER CO.

The annual report and accounts of the Shanghai Pulp and Paper Co., Ld., for the year 1906, states that the profit and loss account, including the balance, Tls. 1,753.03, brought forward from last year, shows a credit of Tls. 65,906.20. During July an interim dividend of five per cent was declared and paid. New additions and repairs during the year 1906, amounting to Tls. 7,051,380, have been written off, as well as Tls. 2,500.00 for depreciation, besides setting aside Tls. 8,000.-00 for reserve, bringing reserve account up to Tls. 45,000.00. From the balance, Tls. 25,854.82, to the credit of profit and loss account, the directors propose to pay a final dividend of five per cent, carrying forward Tls. 3,354.82 to new account. The plant continues to be kept in perfect order, and is working most satisfactorily.

JAPANESE SPINNING CO.'S DIVIDEND

The following annual dividends have just been declared by Japanese spinning companies: The Godo mills of Osaka, 20 per cent, and 10 per cent special, which only take up half the profits for 1906; Kanegafuchi mills, 20 per cent, out of over 60 per cent earned; Tokyo mills, 50 per cent; and the Home and Foreign Cotton Trading Company of Osaka 15 per cent.

UNION INSURANCE SOCIETY OF CANTON, LIMITED.

Report for presentation to the Shareholders at the Thirty-fourth Ordinary Meeting to be held at the Society's Offices, Hongkong, at noon on Saturday, the 13th April, 1907.

The Board has now to lay before the Shareholders a balance sheet containing a summary of the property and liabilities of the Society on the 31st December 1906 and a statement of accounts to the same date.

1905 Account.—After payment of the interim dividend of $30 per share and the bonus of 20 per cent to Contributors passed at the last annual meeting there remains a balance of $835 290.64 as per annexed statement.

The Board recommends that this sum be appropriated as follows:—

A final dividend to shareholders of $12 per share on 10,000 shares.	$120,000.00
An addition to the Sterling Reserve Fund of £30,000 @ exchange 2/3 3/16	264,827.59
To be carried forward to Underwriting Suspense Account to close the account for the year 1905.	450,463.05
	$835,290.64

KYOTO COTTON FLANNEL CO.

The Kyoto Cotton Flannel Company, Kyoto, Japan, paid 30 per cent dividend and proposes to increase its capital from $800,000 to $2,500,000.

TEXTILE MANUFACTURING CO., LTD.

The ordinary general meeting of the shareholders of the Calcutta Textile Manufacturing Company, Limited, was held on the 13th instant. It appears from the audited balance sheet and profit and loss account for the year ending 31st December, 1906, that the company made a net profit for the year of Rs. 5,19,171 which with the previous balance of Rs. 3,426 amounts to Rs. 5,22,598. Out of this amount, the directors had declared and paid an ad-interim dividend for the half year ending 30th June, 1906, on 2,800 shares at Rs. 40 per share absorbing Rs. 1,12,000, and had transferred to engine and machinery deterioration fund account, Rs. 1,11,223; to repairs fund account, Rs. 46,606; to reserve fund account, Rs. 54,000; and to equalization of dividend account, Rs. 54,000; leaving a net balance of Rs. 1,44,768. Out of this amount the directors declared a further dividend at the rate of Rs. 45 per share, absorbing Rs. 1,26,000 and carried forward Rs. 18,768-11-11 to new account.

BOMBAY DYEING AND MANUFACTURING CO.

The ordinary general meeting of the Shareholders of the Bombay Dyeing and Manufacturing Company was held on the 6th instant. The audited balance sheet and profit and loss account for the year ending 31st December 1906, show a net profit for the year of Rs. 181,455-7-5 which, with the previous balance of Rs. 6,608-2-3, amounts to Rs. 1,88,063-9-8. Out of this amount, the directors had declared and paid an ad-interim dividend for the half year ending 30th June 1906 on 4,800 shares at Rs. 12-8-0 per share, absorbing Rs. 60,000, and had also transferred to machinery deterioration fund Rs. 14,527-11-10; repairs fund Rs. 17,751-2-0; reserve fund Rs. 12,000—total: Rs. 1,03,678-13-10, leaving a net balance of Rs. 84,384-11-10. Out of this they declared a further dividend at the rate of Rs. 17-8 per share, absorbing Rs. 84,000, and carried Rs. 384-11-10 to new account.

SIAM STEAM PACKET CO.

At the annual meeting of the Siam Packet Co., a dividend of 8% for the year ending December 31, 1906, was declared. This dividend on the increased capital is estimated as being equal to 12½% on the old capital.

HODEN KEROSENE OIL CO.

The dividend of the Hoden Kerosene Oil Co., Nagaoka, Niigata prefecture, for the last half of 1906, was at the rate of 40 per cent per annum.

LANGKAT OIL CO.

The following information has been received from the Sumatra Director and Manager of the Maatschappij tot Mijn-Bosch-en Landbouwexploitatie in Langkat, Ld.:—

Daily aggregate output of Crude Petroleum	Gallons	110,000
Crude Petroleum in Tanks at date	,,	170,000
Kerosene made since the date of the preceding half monthly telegram	Cases	99,000
Kerosene shipped since the date of the proceeding half-monthly telegram	,,	43,000
Kerosene in Stock at Refinery at date	,,	110,000

PERLAK PETROLEUM CO.

The Perlak Petroleum Company—a venture in Acheen—distributed, a few days ago, a dividend of 28 per cent on its preference shares.

SHANGHAI WATERWORKS, LTD.

At the annual meeting of the shareholders of the Shanghai Waterworks Company, Ltd., a dividend of 40/ a share on the old issue of stock and 19/2 on the new was declared. The transfer to the Reserve was 30,000Tls. and Tls.96,088.56 was carried forward to new account.

SETUL HYDRAULIC TIN MINE.

The following is the condensed account of the company's meeting.

"This Company held its first Annual General Meeting at Seremban on Monday the 25th March, when the Report and Balance Sheet for the year ending 31st December, 1906, were presented and passed and the usual re-election of Directors and Auditor took place.

The Chairman, in reply to queries from shareholders, said that good progress had recently been made with construction work, and he hoped that, barring accidents, the water would be through to the Mine, and sluicing work commenced in about ten days from date. With regard to the issue of $20,000 fresh capital, raising the total capital of the Company to $150,000, he was quite confident that this would provide ample funds for all purposes. Reference being made to a proposal from another local Mining Syndicate to amalgamate with them, the Chairman stated that an offer of this kind had been made, but that, apart from the terms being considered inadequate, the bulk of the Setul Company's members were against the idea.

RUBBER COMPANY REPORTS

A London telegram says:—The Shelford Rubber Estate Co. has declared no dividend.

A Colombo contemporary says:—The Shelford Rubber Estate, Ltd., is an F. M. S. concern. It is too young to pay a dividend; but they have a nice property of 604 acres, with 536 acres planted. The Company expected to get 10,000 lb. of rubber last year but up to September the actual crop was 4,569 lb. of dry rubber for the nine months.

BLACKWATER ESTATE (KLANG) RUBBER CO., LTD.

The second ordinary general meeting of the shareholders of the above Company was held at the Office of the Agents and Secretaries (Messrs. Skrine & Co.), Colombo, on March 23, when the Hon. Mr. W. H. Figg (Director) presided and there were present Messrs. H. Goodwyn (Director), W. Shakespeare, A. E. de Silva, and R. Weber representing the Agents and Secretaries.

The Chairman moved the adoption of the following Directors' report:—

Directors:—The Hon. Mr. W. H. Figg, Mr. F. L. Clements, and Mr. H. Goodwyn.

The yield of Para rubber during the year was 13,033 lb. against an estimate of 10,000 lb. and the crop was sold at an average net price of R3.68 per lb. The profit as per account to 30th June was R9,407.95 and at 31st December it stood at R25,936.89, equal to 14⅓ per cent on the paid up capital of the Company, but the Directors have reduced it to R18,657.53, writing off the whole of the Preliminary Expenses, amounting to R7,279.36. They now recommend the payment of a dividend of 10 per cent=R18,100, and that the remaining R557.53 be carried forward.

FEDERATED MALAY STATES RUBBER CO. (LTD.)

The Board of Directors of the Federated Malay States Rubber Company, Limited, have decided on the payment for the current financial year of an interim dividend of 5 per cent on the capital called up. This dividend will be payable on and after March 15, 1907.

THE BEERLAC (SELANGOR) RUBBER CO.

At the annual meeting held at the company's offices April 3, a dividend of 5% was directed paid and R1,274.48 was carried forward.

JEBONG RUBBER CO.

The report and accounts of the Directors of the Jebong (Perak) Rubber Co., Ltd, were submitted at the first annual general meeting of shareholders in Colombo:—

The Directors have pleasure in submitting their first report and accounts of the Company for the year ended 31st December, 1906.

The crop of rubber secured was 58,670 lbs. of which 52,038 lbs. have been sold in London at a net average of slightly over 5/1d. and the balance, consisting of one invoice, has been estimated to realize 5/- net. The Nursery Account shows a profit of Rs. 48,820.35 of which Rs. 21,120, derived from the sale of stumps, as representing part of the capital value of the estate when taken over by the Company, has been credited to Capital Account, and the balance from sale of seed, Rs. 27,700.35, has been credited to Working Account.

The expenditure on Working Account on an average rate of exchange of Rs. 176 to $100 amounted to Rs. 55,498.32 and the cost of production F. O. B. Penang to 94.58 cents of a rupee.

After payment of Directors', Secretaries', and Auditor's fees and commission to the Superintendent (the whole of whose salary has been charged to working expenses), the balance of profit on the year's working amounts to Rs. 179.675.84 equal to 14.9 per cent on the paid up capital of the Company. An interim dividend of 5 per cent was paid in October last, absorbing Rs. 60,000 and the Directors now recommend the payment of a final dividend of 7 per cent, making 12 per cent for the year placing Rs 30,000 to Reserve Fund to meet expenditure during the current year on clearings not yet in bearing, and carrying forward the balance Rs. 5,675.84 to the current season's account.

RUBBER IN BORNEO.

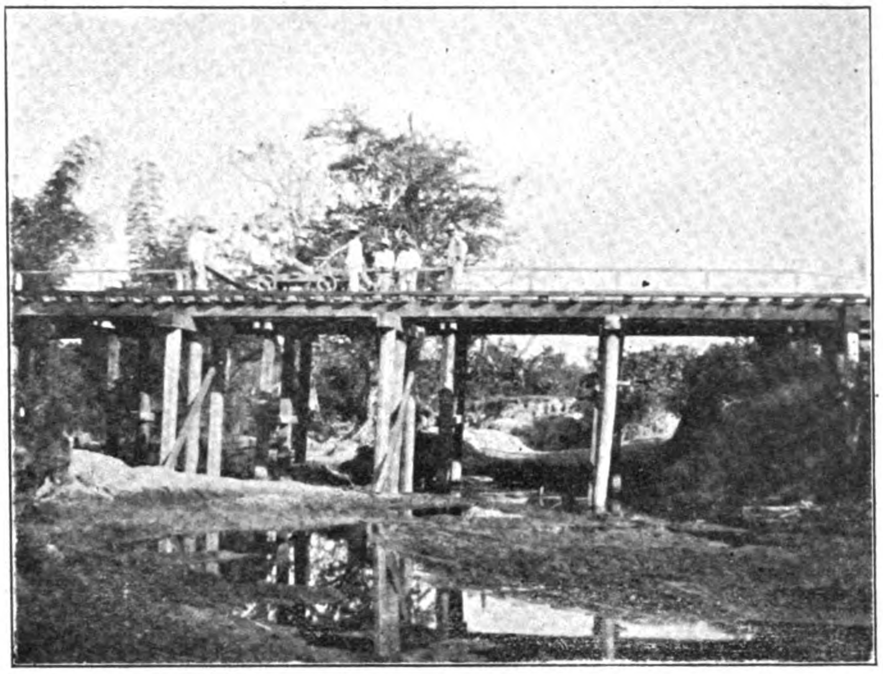
In the report of the commissioner of lands for British North Borneo it is stated that the following is a list of the lands sold to Rubber Companies.

	acres
The British Borneo Para Rubber Co.	3,000
The Manchester N. Borneo Rubber Co.	13,000
The Langkon Borneo Rubber Co.	12,000
The Tenom Borneo Rubber Co.	10,000

The last named company has changed its concession at Tenom for an equal area near Beaufort on the railway. The Manchester Co. at Melalap have already prepared and planted up a fine area.—*Singapore Free Press.*

RAILROAD CONSTRUCTION IN THE PHILIPPINES

The Manila Railway Company has been actively engaged during the last three months on all its concessions in Luzon, and already about seventy miles have been graded, while the steel has been laid to some extent on several of the new lines and branches.



TARLAC RIVER BRIDGE ON THE PANIQUI—CAMILING RAILROAD

On the Dagupan-San Fabian section of the line to San Fernando de Unión, a distance of approximately 10 miles, the grading has been completed and the steel laid for about three miles. Work is now in progress on the bridges and other permanent construction in connection with the laying of the steel on the balance of this section.

The branch from San Fabian to Camp One has been surveyed and there is prospect that work on the road bed will begin in earnest next month.

The line from San Fernando de Pampanga to Florida Blanca by way of Guagua, a distance of 14 miles, has been graded and is now almost ready for the steel.

The line from Manila to Batangas as far as Calamba has been the scene of activity. The distance is thirty miles, one-third of which is graded and the work progressing favorably. It is expected that track laying will begin there next month.

On the Cavite branch of the system, one-third of the line to Naic has been graded, the principal part of the work having been done on the section between Manila and Las Piñas. No work has yet been done on the loop to San Francisco de Malabon although the surveys are under way.

On all the other projected lines in Luzon the company has been active making surveys and these will in many instances be completed shortly. Material is arriving from time to time and there is prospect that the work of construction will not be delayed on account of shortage in supplies, although some difficulty was anticipated in the matter of the supply of steel.

PHILIPPINE RAILWAY CO.

The construction work on the Philippine Railway Co. lines continues in Cebu and Panay with the usual expedition. During the month seven miles of steel have been laid in Cebu, making in all about ten miles of track. Of this, six miles have been laid south of Cebu to the gravel pit and four miles on the line running north and in the yards in Cebu. The grading in Cebu extends approximately over 30 miles of the Cebu roads, of which 23 miles are to the north, towards Danao. The Company expects to discharge 4,000 tons of railroad material at Cebu May 12. Of this shipload consigned to that point, there are 3,000 tons of rails, the balance consisting of machinery, supplies and equipment. All this cargo will be utilized in the construction work in Cebu.

BRIDGE WORK ON THE PANIQUI RAILROAD

The work in Panay is also progressing rapidly. No steel has been laid beyond Jaro during the month. The grading continues and approximately twenty miles will be ready for the steel as soon as the temporary bridges are completed.

The company will have sufficient steel on hand to lay track for at least 80 miles in all when the cargo of materials is discharged May 12.

The standard plans and specifications for shops, round-houses, stations, etc., have gone forward to the governor general for his approval. These buildings will be of the most modern construction and built with special reference to sanitation.

Vice-President Poland, of the Philippine Railway, Chief Engineer Beard in charge of construction, and Supervising Railway Expert Goodale sailed for Cebu May 4, on a fifteen day tour of inspection of the different lines.

TARLAC RAILWAY CO.

The Tarlac Railroad, which connects Paniqui, a station on the Manila and Dagupan Railroad, and Camiling, Tarlac province, was formally opened to traffic May 7. This line is twelve miles in length and taps one of the richest agricultural districts in Northern Luzon. It is estimated that this year over 20,000 tons of produce will be carried over this line and already on that part of the line now under operation over 3,000 passengers are carried daily.

The company consists of local capitalists. Arrangements have been entered into with the Manila and Dagupan Railway for the operation of the road in regard to transportation, while the Tarlac Railway provides for the up-keep of the track. It is reported that the Manila and Dagupan Company is to receive 50% of the receipts for the use of the rolling stock.

The construction of this line was accomplished in about five months. The Manila Construction Co., under the direction of Harry G. Thurber, constructing engineer, had the contract and the work was pushed in order that the road might be completed in time to handle this year's crop.

In all there were over 4,000 feet of bridging, the largest bridge being constructed over the Tarlac river. This bridge is 1,400 feet in length.

Paniqui, the point on the Manila Dagupan railway which serves as the junction for this new line, is about 87 miles north of Manila, and Camiling, the west terminal of the road, is situated at the head of the Camiling valley. This valley is one of the richest in the Philippines and half of these rich lands awaits the progressive farmer who hitherto hesitated invading this promising field on account of the lack of transportation facilities. Now that this has been overcome by the construction of this road, the area of land under crop will be doubled next year. The saving in transportation cost to the farmers is about ₱2.50 a ton.

The Commission is still considering the application for a franchise presented recently by the Lepanto Mining Co. for the construction and operation of a railroad from the immense copper mines in Lepanto to the West coast of Luzon. It is understood that the franchise will be granted with a few restrictions so as to prevent a monopoly of any passes in the mountain districts.

PUBLIC IMPROVEMENTS IN THE PHILIPPINES.

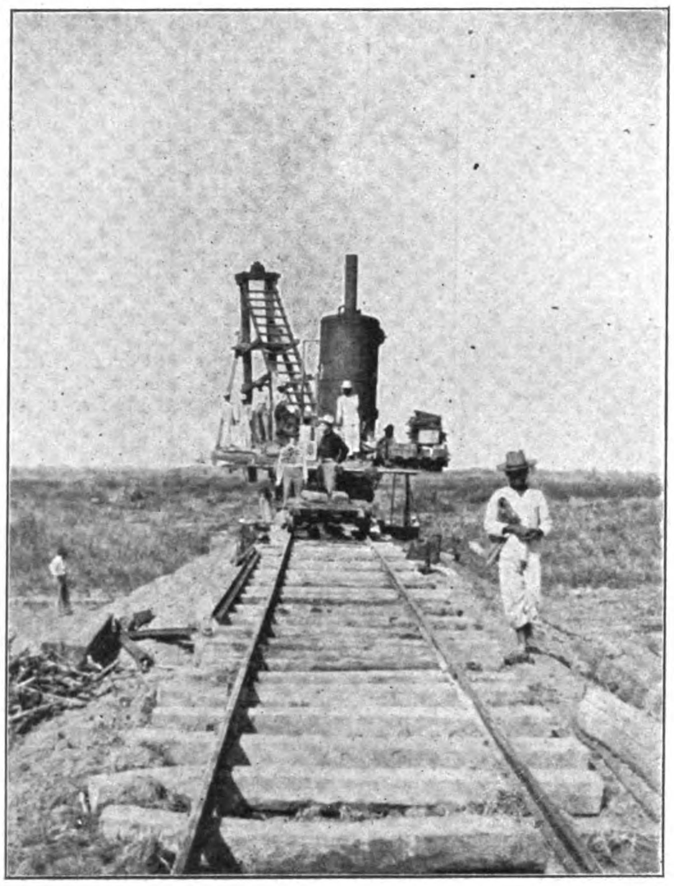
Messrs. J. G. White & Co. have concluded their contract for the harbor improvements at Iloilo. The contract price for the work was $2,250,000 and included the dredging of the river for 7,000 feet to a witdh of 350 feet and deep enough to accommodate the largest vessels calling at that port. A river wall over 7,000 feet long was also constructed and the mud taken from the river and harbor was utilized to fill in a made ground extension behind the river wall.

The improvements in the harbor of Cebu the contract price of which was $500,000 will be completed in September of this year. In building the wall in Cebu concrete is being utilized which promises much stronger construction. The dredging will be greatly expedited by the transfer of the dredger heretofore used on the Iloilo harbor construction. Messrs. J. G. White & Co. are the contractors.

The United States Engineer's office awarded the contract for the delivery at Olongapo of 50,000 barrels of cement to Messrs. Findlay & Co. of Manila, the lowest bidder. The price is $2.73 delivered at Grande Island near Olongapo. The other bidders were Messrs. German & Co. and Messrs. Anderson & Co., both of Manila. Findlay & Co. handle the Alsen brand.

THIRTY THOUSAND BALDWIN LOCOMOTIVES.

Early in February the 30,000th locomotive to be built at the Baldwin Locomotive Works was completed. The event was celebrated by flying a great white pennant bearing the number over the office of the company. The engine was a huge freighter built for the Pittsburg, Shawmont and Northern Railway for service chiefly as a "helper" on heavy grades. Its weight is about 288,000 pounds exclusive of the tender. Including the tender its weight is about 458,000 pounds. It has single cylinders, 28 by 32, and is fitted with a superheater in the smoke-box. The superheater is of novel construction, designed by S. M. Vauclain. It has 4,796 square feet of heating service. This is very large. The boiler is wagon top, 78¾ inches in diameter. The firebox is 9 feet long by 6½ feet on the inside. There are five pairs of drawing wheels, each 57 inches in diameter, and there is a "pony" truck, with small wheels front and back. The capacity of the tank is unusually large—8,500 gallons.



PILE DRIVER IN OPERATION AT END OF THREE MILE FILL ACROSS THE TARLAC BOTTOMS

On February 7, John H. Converse, president of the Burnham, Williams Co., which operates the works, gave to newspaper men the following interview:

"I have seen the production of about 28,000 of the 30,000 locomotives turned out in these shops," said President Converse. "When I came here in 1870, although the works had been in operation about thirty-seven years, only 2,000 locomotives had been constructed.

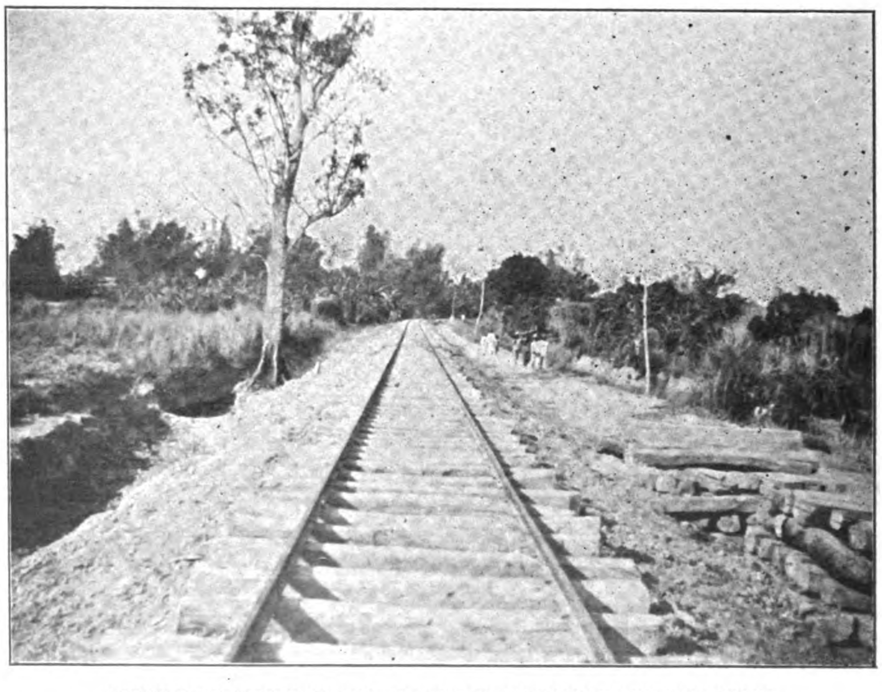
"It was the ambition of the management when I joined it to get the output up to one locomotive a day, or 300 in a year, and that was accomplished about 1872. Since then the capacity has steadily increased till now it might be placed at nine locomotives a day. In 1870 the concern employed 1,200 men. The employes of the Baldwin Locomotives Works in this city and at Eddystone, near Chester, now number 19,200."

RAILWAY EXTENSION IN CEYLON.

Reuter's agency is informed that the Ceylon Chamber of Commerce has telegraphed to the Ceylon association in London urging the early construction of the Ratnapura Railway, the Passara extension, and the Mannaar Branch Railway, all of which are necessary in the interests of the colony. The Mannaar extension is to link up the northern railway of Ceylon with the southern railway systems of India, the Straits of Mannaar being traversed by a ferry. It is claimed that with this extension the whole of the trade of southern India would find an outlet at Colombo. The Ratnapura and Passara extensions are concerned with new lines in the tea-planting districts of Ceylon where they are needed to replace cartage. The recent development of rubber in these districts makes the extensions essential.

TRADE-MARKS IN CHINA.

The Anglo-Japanese Gazette is the authority for the following statement: An arrangement has been concluded between the British Government and the Russian Government providing for the mutual protection of British and Russian trade-marks in China. In future a British subject whose trade-mark, duly registered in Russia, has been infringed by a Russian subject in China will be able to obtain redress from the Russian consular tribunals, and similarly it will be open to a Russian subject whose trade-mark, duly registered in Great Britain, has been infringed by a British subject in China, to take proceedings against the latter in the British court. Similar arrangements already exist between the Governments of Great Britain, Denmark, France, Germany, Italy, the Netherlands, Portugal, and the United States.



SECTION OF THE PANIQUI—CAMILING RAILROAD NEAR PANIQUI

THE SANTA MESA CEMENT TILE AND PIPE FACTORY

The first factory to be established in the Orient for the manufacture of cement tile and pipe was the one that today bears the name of The Santa Mesa Cement Tile and Pipe Factory, situated on the bank of the Pasig River at Santa Mesa, Manila. This institution was founded by Mr. Carl Fressel in 1886, and he continued as proprietor until his death in 1904. When first opened it was situated on the Santa Mesa Road, but was later transferred to its present site, in order to have the benefit of water transportation, by Mr. G. Ludewig, the actual manager.

The site on which the present modern plant stands covers an area of 24,000 square meters comprising in all thirteen buildings sufficiently large to give plenty of space to the several departments into which the works are divided.

One building is set aside for cement colors with a mixing room attached where all the material is made available and the work in the department carried on with despatch.

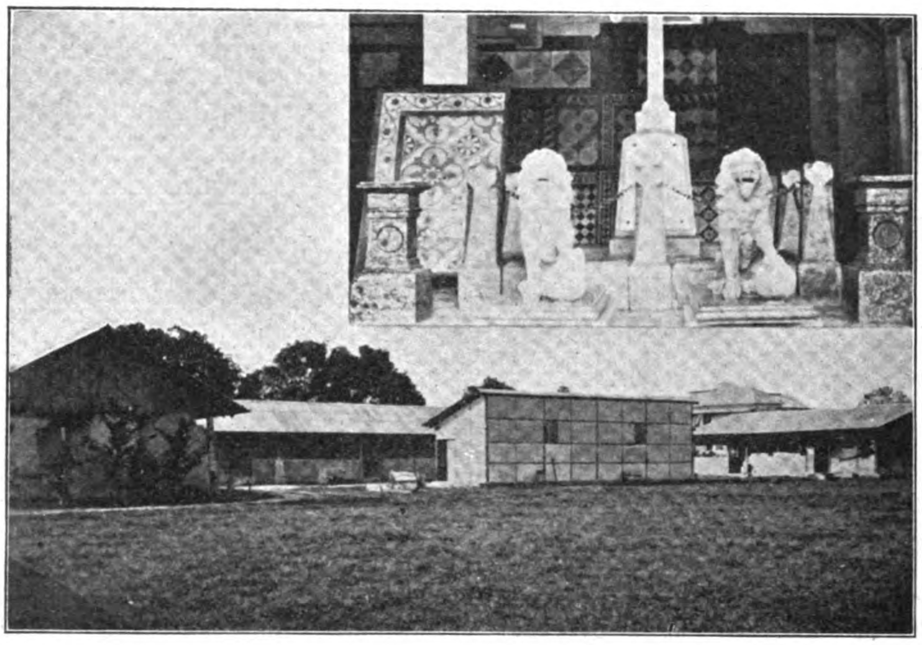
The carpenter shop, which occupies another building, is equipped with all the necessary modern machinery so that all the construction work connected with the factory is greatly expedited.

Besides these two buildings there are three press shops each with a large store room for tiles; one shop equipped with a motor press and motor for same together with a polisher utilized in finishing marble construction; a shop with a large hydraulic press for power and heat; one warehouse for mouldings, four pipe camarines where the finished product is stored, and besides all these buildings there are two large cement brick factories.

VIEWS OF THE SANTA MESA CEMENT TILE AND PIPE FACTORY

With this splendid equipment the works turn out daily 7,000 tiles, 6,000 bricks and 1,000 meters of different sizes of pipe. In all the different classes of work this enterprising firm uses only the very best material and gives it the most careful supervision.

The cement and colors are all first class and imported direct from the German manufacturers so that the output may be depended upon as being of first class quality.



ANOTHER VIEW OF THE SANTA MESA CEMENT TILE AND PIPE FACTORY WITH SAMPLES OF WORK

In addition to the manufacturing feature contracts are undertaken by the Santa Mesa Cement Tile and Pipe Factory for all kinds of cement construction, one special feature of which is the supplying of imitation marble tiles and doorsteps and other ornamental construction in which cement is utilized.

This factory furnished the Philippines Telephone Company the cement conduits for the construction of the subways for the cables, a total of 50,000 cable feet. As an indication of the capacity and expedition with which this contract was handled all the material was supplied in 20 days.

So effective has been the service of this well established manufactory that its product is used exclusively for all public and private work in the Philippines. This is the best testimonial of the high standard of the product.

In addition to the general recognition given this factory it was awarded the gold medal at the Philippine exhibition held in 1895.

Cement bricks are not more expensive than other bricks and may be made in any colors. The hollow compressed are especially adapted to the tropics, the air chamber keeping out all heat. For house building these bricks cannot be equalled for strength and durability while coolness, which is so desirable in the tropics, is ever assured.

One advantage of the cement brick that appeals to the householder is the tenacity with which it retains its color, and this does away with the necessity of painting a house in the construction of which this brick is used exclusively. The brick is carefully polished so it may be easily washed and still retain its brightness.

The bricks turned out by this factory are of the American Standard viz: $8 \times 3\frac{7}{8} \times 2$ inches.

KOBE HARBOUR IMPROVEMENTS

The growth of trade at the port of Kobe has advanced so rapidly during the past few years that the Government have at last been compelled to face the problem of providing for the necessary facilities for the handling of the increasing volume of cargo which annually passes through this part. Dr. Sakatani, Minister of Finance, when addressing a meeting of prominent commercial men in Kobe lately expressed the opinion that it was most essential that some improvement should be made in the means of communication between Tokyo, Seoul and Peking, and Kobe made the centre for such facilities. The present scheme, upon which operations will commence early in the New Year, includes the construction of a further breakwater from Wada Point, while the breakwater shown on the sketch plan given below will be extended to meet it, thus forming a harbor of considerable dimensions. The whole of the present Bund and the greater part of Kaigan Dori will then be transformed into jetties and wharves. Similar operations will be undertaken at Hyogo, where the water front will be reclaimed, and wharves extended as far as the Kawasaki Dockyard Company'sworks.

The estimated expenditure and revenue is shown below:

	Expenditure. Yen.	Revenue. Yen.	Fees. Yen.	Profits. Yen.
West Onohama and Hyogo. Reclamation Works at East Onohama.	21,790,000	2,250,153	320,000	1,930,155
Entire Works at East Onohama.	10,700,000	599,313	155,000	444,313
Total. . . .	32,490,000	2,328,216	435,000	1,892,216

The work comprises the following:—

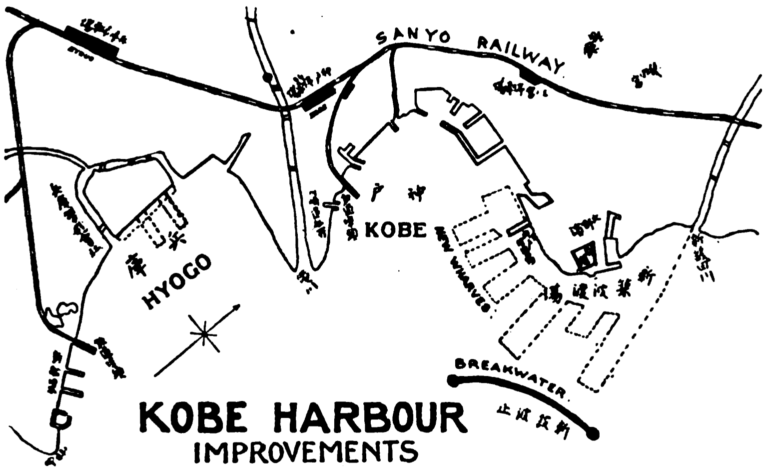
1.—An area will be reclaimed from the sea at the western part of Onohama, and one long jetty, 1,620 feet in length and 360 feet in width, and three shorter jetties, each 1,200 feet in length and 360 feet in width, will be constructed. The jetties will have roofing on both sides and will be equipped with electric lighting and 130 powerful cranes. A railway will connect the jetties with the existing line (there will be some 22 miles of railway in all). A portion of the reclaimed area will be reserved for the erection of godowns

2.—At the eastern part of Onohama, about 110,000 tsubo of land will be reclaimed from the sea. A jetty of 1,680 feet in length and 360 feet in width, and a shorter one, about 900 feet in length and 690 feet in width will be constructed. These jetties will be roofed and equipped in a similar manner to those at the western part of Onohama.

3.—A breakwater, 3,240 feet in length, will be constructed off Onohama.

4.—In the direction of Hyogo two iron piers, 420 feet in length and 60 ken wide, will be constructed, together with a landing place of six hundred feet. The piers will have roofs and will be equipped with cranes, etc. A railway line three miles in length, will be laid for the purpose of connecting the piers with the branch of the Sanyo railway. The works here will chiefly accommodate Chinese and Korean shipping.

The construction of the works at Onohama will take eight years, while the Hyogo proposals ase expected to be completed in four years.



Sketch of Kobe Harbour.

DOCKYARDS AT MOJI

It is said that the concession obtained by Mr. Noda, M. P., Mr. Sasaki, M. P., Mr. Mitsui, M. P., and others, for the construction of a big dockyard at Okubo, Moji, with a capital of -Y-5,000,000, will be purchased by Franco-Belgian and Anglo-Japanese Syndicates. The Syndicates are reported to be making arrangements to construct a dockyard on a much bigger scale than was contemplated, the capital being raised to -Y-10,000,000, half of which would be allotted to each syndicate. According to present plans, the dockyard will have accommodation for vessels of over 15,000 tons. It is further said that the Director of the Oriental Glass and Brush Factory at Osaka, representing the Franco-Belgian syndicate, arrived at Moji, accompanied by an engineer from Shanghai, a few days ago, and at once commenced a survey of the coast. Whether or not the Syndicates will really undertake the enterprise is still somewhat uncertain as yet, but it is reported that in any case the prospects of the dockyard scheme are very bright. In the event of the dockyard being constructed, it is intended that a railway shall be built between it and Moji harbor for the purpose of obtaining coal and other necessaries. Okubo will consequently be opened to general traffic and a branch of the Moji Customhouse will be established there. Should the project be realized, it is anticipated that the Mitsu Bish Dockyard at Nagasaki will be considerably affected.

THE HARIMA DOCKYARD COMPANY

The docks of the lately established Harima Dockyard Kabushiki Kaisha, which has a capital of -Y-500,000, are located at Aioi village, Akao district, Hiogo prefecture. They are at present two in number, the larger being 430 feet and the smaller 280 feet. The depth of water in the Bay at the lowest tide is five fathoms. There is excellent protection from storms, the island of Iyejima lying at the entrance of the Bay and serving as a natural breakwater. The dockyard is a little over two miles south of Naba Station on the Sanyo railway line and about 20 miles from Kobe by sea. By rail, it can be reached from Kobe in about three and a half-hours. The construction of a big dock of 600 feet is now in contemplation.—*Kobe Herald.*

SMOKELESS POWDER MACHINERY FOR CHINA

Consul T. J. Albert, of Brunswick, advises that a German firm, which manufactures centrifugal machinery for sugar production and also makes a specialty of machinery for the manufacture of smokeless powder, has just shipped to the Chinese state powder factory Hanyang, at Hankow, a complete nitrate plant for the manufacture of smokeless powder. Hankow is situated in the interior of China, on the Yangtze Kiang River, about 600 miles from Shanghai. The plant occupied 13 double cars. This is the third nitrate plant which this firm has delivered to the Chinese national factories. Smokeless powder is manufactured from gun cotton by the last set of machinery shipped, the cotton being steeped in a mixture of saltpeter and sulphuric acid.

A LIVE LOAD SPECIFICATION FOR HIGHWAY BRIDGES

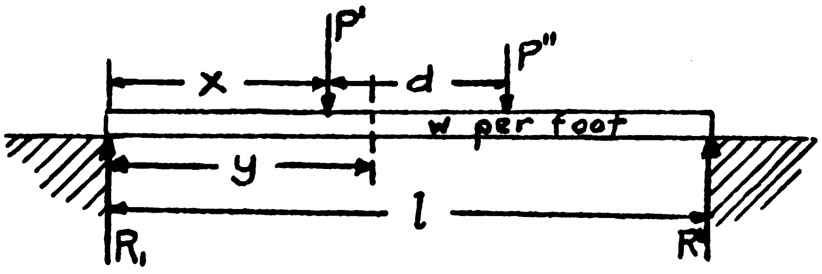
By JOHN HOWARD FORD
San Fernando, Pampanga, P. I.

In the design of small highway bridges the determining factor is in most cases the live load produced by a passing road roller or traction engine, consisting of two concentrated loads at a fixed distance apart. For such a specification the critical location of the loads may be determined as follows:

$$M = R'y - \frac{wy^2}{2} - P'y + P'x \qquad (2)$$

Substituting (1) in (2)

$$M = \frac{wly}{2} + P'x - \frac{P'xy}{l} + P''y - \frac{P''xy}{l} - \frac{P''dy}{l} - \frac{wy^2}{2} \qquad (3)$$



Let P' and P" be the concentrated loads, P' being the larger;

- w the dead load per unit of length;
- l the clear span;
- d the fixed distance between P' and P'';
- x the distance from the nearest abutment to P';
- y the distance to the critical section;
- R' and R'' the abutment reactions; and
- M the maximum bending moment.

Then M occurs under P', where

$$x = y = \frac{2P'l + 2P''l - 2P''d + wl^2}{4P' + 4P'' + 2wl}$$

$$\text{and} \quad M = \frac{wly}{2} + \frac{P'y^2}{l} + \frac{P''y^2}{l} + \frac{wy^2}{2} + \frac{P''dy}{l} + P'y + P''y$$

Proof: Take moments about R''

$$R'l = \frac{wl^2}{2} + P'(l - x) + P''(l - x - d) \qquad (1)$$

By inspection of Fig. 1, it is seen that y cannot be less than x; and, for $d < \frac{l}{2}$, x must have a positive value. Inspecting (3), it is seen that M is a linear function of x; hence the maximum value of M must lie in a limiting plane intersecting the M-X plane, either $x = y$ or $x = 0$. But P' is the larger load; hence $x = 0$ cannot give maximum. Therefore, the maximum will lie in the plane $x = y$. Making $x = y$ in (3) and differentiating,

$$\frac{dM}{dy} = \frac{wl}{2} - \frac{2P'y}{l} + P'' - \frac{2P''y}{l} - \frac{P''d}{l} - wy + P' = 0 \qquad (4)$$

$$y = \frac{2P'l + 2P''l - 2P''d + wl^2}{4P' + 4P'' + 2wl} \qquad (5)$$

For $P' = P''$ and $w = 0$, (5) becomes

$$y = \frac{l}{2} - \frac{d}{4}$$

for values of d up to $d = (2 - \sqrt{2})\, l = .586l$

FILIPINO LABOR FOR MEXICO

Judge Paul W. Linebarger, who served as United States District Judge in the Philippines, has recently been in Mexico City on his way to Washington, where his resignation, recently tendered, will probably be accepted by the government, in the event of which he may settle in Mexico.

He has for five years been associated closely with the Filipinos, and he says that in his opinion they are much under-estimated by the Americans. He has found them sober, more or less industrious, devoted to their families, and easy to deal with when they are treated respectfully and handled wisely. Like all Orientals, they are quick to take offense, but easy and tractable when handled wisely. Judge Linebarger says that they are essentially Oriental, and that the Spanish rule has left no such mark of language and blood as it has in Mexico. This is due, he says, to the fact that when the islands were conquered by the Spaniards they were very sparsely inhabited, and that there was never the inducement to keep them that there was in the rich, civilized and well-developed countries like Mexico, Cuba and the South American kingdoms. The mark which the Spanish have left on the islands is comparatively a slight one, and although the language of society and business is Spanish, the natives have their own dialects, which must be used with them always.

Nevertheless, the Judge says, the Filipinos are ready for sympathy with the Mexicans and other Spanish-Americans, not only because they have had to deal with kindred peoples, in the higher classes of the islands, but because they know Mexico as the country where their money comes from, for the Mexican peso is the standard of exchange all over the Orient.

CLIMATIC CONDITIONS SIMILAR.

"The United States," Judge Linebarger says, "cannot offer inducements that will bring the Filipinos to that country. The climate is not pleasant to them. The American laborer does not want the Oriental, and in the field of skilled labor he would have too severe competition. Mexico, on the other hand, offers every inducement. Her climate is almost the same as that of the Philippines, and the hot countries of the coast and the port towns on both the Gulf and the Pacific sides are particularly pleasing in prospect for the Filipino. Every inducement and welcome is held out to the immigrant here, and the vast undeveloped resources of the country are always an attraction. Then as far as I can see, the manufacturing industry of the country is latent as yet, and when the great industrial awakening comes, as it inevitably must, there will be a great opportunity for skilled artisans and shopmen. The Filipino makes a good mechanic—one of the best in the world—and the opportunities for him here in that line should be great.

"Other races and peoples have been tried here, I understand, and with little success. I believe that the Filipino would solve the labor problem, and, as that solution, would be very welcome here in Mexico. He is a proud Oriental, though, and must be approached diplomatically. Some effort has been made to induce him to go to Hawaii, but but with little success. He must be reached through his fellows, and the Americans who have been in the Philippines long enough are the men who must take up that work. But I believe that Mexico is a great country for the Filipinos and that the Filipinos will be of much benefit to Mexico."

ORIENTAL TRADE FOR MEXICO.

Commerce with the Orient, Judge Linebarger says, is the great future for Mexico. And the Philippines are the open door to that commerce.

"The Mexican dollar is the trade coin of fifty million Oriental people," he continued, "and the very name of Mexico means solid credit and an honest deal to them. There was never a greater opportunity offered any people in the world than Mexico has had, and still has. The Orient is largely an agricultural section. Mexico is much the same, as yet, but her future as a manufacturing country is assured by wise laws and careful supervision. Everybody is busy, and all have fine opportunities for investors. Soon Mexico will be ready to export manufactured articles, and to the Philippines, straight around the torrid zone, is not far, as ships move in these days. Kindred people and the same language offer an open door. China and Japan are but a step from Manila. I believe that through that door the great trade of the Orient, or a comfortable slice of it, will come to Mexico as soon as she is ready to receive it."

COTTON GROWING IN KOREA

The prospect for cotton in Korea, from reports received, seems most promising. Experiments made this year resulted in producing 400 pounds per acre or about twice as much as the average production in the United States. The bureau of agriculture and commerce of Japan has submitted estimates and claims that there are 175,000 acres of waste land in Korea suitable for the culture of cotton and that the yield per annum should be at least 50,000,000 pounds. If the industry proves the success promised by the estimates made, the cotton produced in Korea will be sufficient to meet the demand in Japan for the raw article. Referring to the prospects for cotton in Korea, the *Anglo-Japanese Gazette* says:

"We now learn that the first crop has just been gathered near Mokpo. This land was planted with American upland cotton seed from the experimental grounds in Japan by the Kankoku Menkwa Kwaisha, who have succeeded the Cotton Growers' Association, under whose auspices the first experiments were made.

"At present only some 175 acres have been placed under cultivation, and this year's crop consists of 100 bales, weighing 50,000 lbs. The crop has been purchased by the Osaka Godo Boseki, and they report that the fibre is fine and soft, with exceptional lustre, and well suited for mixture in the spinning of fine yarn. The value is estimated at Y31 per picul.

"The Company intend to extend the area of the ground under cultivation, and anticipate a crop of 1,000 bales next season, and of some 10,000 bales the following year. Careful investigations have been recently made by experts from the Department of Agriculture and Commerce, and it is estimated that if all the waste land and inferior agricultural land suitable for cotton growing in Korea be put under cotton, some 175,000 acres could be thus cultivated, giving a yield, taking the present year's crop as an average one, of 100,000 bales, or 50,000,000 lbs. Experiments made this year have given a crop of 400 lbs. (three piculs) per acre, which is about twice the average crop of cotton in the United States per acre. This would appear incredible were it not for the following points. The crop has been worked with Korean coolies without any sparing of labor, and, in fact, is highly, not as in the case of the American crop, roughly cultivated.

"It is, naturally, obvious that large areas in Korea could not be cultivated in the same painstaking manner, and the results of this year would not be likely to be realized when cultivation on an extended scale takes place. The importance to Japan of the introduction of cotton culture into Korea is great. If Korea can be made to produce anything like 100,000 bales of upland cotton per annum half the present consumption by Japanese spinners of American imported cotton would be grown in Korea."

PENANG TO BUILD TRAMCARS

The Penang Municipal Commissioners have decided to try building a tram car locally. The cost complete at Home is £602, and £90 has to be paid for freight. They think they can build a similar car here with native wood for about $2,000 and the equipment from Home would come to about £350. Authority has been given to try the experiment. $2,000 is about £250, which added to the £350 for equipment makes £600, which is not much below the Home price, assuming that cost of freight of the equipment has been taken into account. We doubt whether the margin of saving is sufficient to justify the experiment, all things being considered. While all in favor of local industries being encouraged, it is obvious that for specialties like tramcars, the local trade cannot hope to compete with the Home firms. The work, of local wood, is not unlikely to be inferior; a certain establishment will have to be created if the work is done departmentally, and if the establishment needs justification, the experiment will have to pay for that. When once an establishment is created, Government or Municipality, we in Singapore have experience of how rapid is its growth, and how difficult is retrenchment. It may be contemplated in Penang to give out the tramcar construction to some firm. That would be less harmful to the taxpayers' interests than doing it departmentally. But till we see the Singapore Tramway Co. constructing its cars locally we should feel inclined to doubt the wisdom, from an economical point of view, of Penang doing it.—*Singapore Free Press.*

JAPAN-CHINESE RAILWAY AGREEMENT

The Japan-Chinese Railway agreement was signed at Peking April 15, and consists of eleven clauses, of which the important ones are as follows:—

1.—China shall redeem the Mukden-Hsinmintun Railway, the price being 1,600,000 yen.

2.—A half of the necessary capital for constructing a railway between Kirin and Chiangchun should be borrowed from the Japanese South-Manchurian Railway Company.

3.—The terms of loans of the Mukden-Hsinmintun and Kirin-Changchun Railways are to be 18 and 25 years respectively.

4.—If the loans are not repaid at the end of the term the whole property of the said railways shall be transferred to the South Manchurian Railway Company.

5.—The railways are not to be mortgaged as security to other countries.

6.—The Chief Engineer and the Chief Accountants should be Japanese subjects.

EARNINGS OF THE TOKYO RAILWAY

The *Mainichi Dempo* publishes figures showing the gross earnings of the Tokyo Railway during the 15 days ended April 3rd, which may be regarded as the 15 opening days of the Exhibition. The figures are:—

	Yen.
20th March	14,832
21st ,,	16,055
22nd ,,	14,358
23rd ,,	12,237
24th ,,	16,222
25th ,,	11,819
26th ,,	17,085
27th ,,	13,148
28th ,,	18,057
29th ,,	16,182
30th ,,	17,254
31st ,,	18,403
1st April	11,986
2nd ,,	20,304
3rd ,,	22,126

During these 15 days there was much inclement weather, and the state of the climate has a great effect upon travel in Tokyo. The gross earnings for the 15 days amounted to 240,000 *yen*, which is at the average rate of 16,000 daily as against the previous average of 13,000. It is expected that after the 10th, when the weather gets warm and the flower season commences, the gross earnings will amount to 30,000 *yen* daily, but that appears to be a slightly optimistic estimate. At any rate if the Company's electric-lighting enterprise proves at all successful, the dividend ought soon to rise to at least 11 or 12 per cent.

SINGAPORE AND SIAM'S RAILWAY DEVELOPMENT

Burma has now decided on the survey of a railway line to the Siamese border, and the hope is expressed that the Siamese government will run a short line westwards to join up with the projected Burmese railway to Myawadi. As a matter of fact Siam may fairly be regarded as having taken the initiative in this matter. In last year's budget a sum of Ticals 1,450,000 was provided for the Sawankaloke line, a branch westwards from the Northern Line which is the main item in Siam's programme of railway construction. It is true this branch does not go a great way, and one cannot expect that there will be any haste shown in continuing the branch to Raheng and on to the frontier. The line will be constructed in time, however, and it is something that a start has been made. Action on the part of Burma, it must be remembered, is also sure to be very leisurely; the railway connection will provide a stimulus to trade, no doubt, but big returns are not to be expected in the immediate future from such lines. The *Singapore Free Press* looks forward to Bangkok having direct connection with Rangoon and to residents here taking Rangoon as the regular port of embarkation for Europe. But we do not think the existing connection with the Straits is so likely to be severed. The Peninsular Railway will presumably be constructed before the Sawankaloke branch approaches Burma, so that in that uncertain future when the main railway lines are completed Penang is much more likely to take the place of Singapore than is Rangoon.—*Bangkok Times.*

JAPANESE SUBSIDY APPROPRIATION

The total amount of subsidy for the encouragement of Japanese shipping, which was included in the general estimates of the Government for the fiscal year of 1907-8 was 325,000 yen. The greater part of the above amount will be appropriated for the encouragement of the steamship service between Tsuruga and Vladivostok. The Oya Shosen Kaisha's steamer Amakusa Maru of 2 519 tons, which was formerly the ferry boat Amur, belonging to the Chinese Eastern Railway Company, will be entitled to receive a subsidy. She is a ship of 14 knots so that she is capable of covering the distance between Tsuruga and Vladivostok in 38 or 40 hours.—*Japan Advertiser.*

KABUL COALFIELDS

The coalfields of Kabul lie in Ghorband to the north of Kabul and northwest of the Paghman range. They are some forty miles from the Capital. A tramway or, better still, a light railway would suffice; for the country, though mountainous, does not present any serious engineering difficulties. There is already a military road running through Ghorband, and fairly good gradients should be obtained. If coal is worked it will result in the development of the industries at Kabul, and will facilitate operations in the Military factories, which have been seriously handicapped by want of fuel.

FAR EASTERN SYNDICATE

Vernacular papers state that a number of French and Belgian capitalists have organized a large syndicate with the object of undertaking various enterprises in Japan, China and other countries in the East. The French capitalists consist of the Paris Bank, the Holland Bank and the Paris Bankers' Association, while the Belgian capitalists include the Eastern Bank, another bank and other influential financiers. The syndicate will be represented by two agents in Japan, with offices at Uchisaiwaicho, Kojimachi-ku, Tokyo. Baron Shibusawa, Mr. T. Nagamori and some other business men will act as advisers. The syndicate is prepared to invest capital in all manner of lucrative enterprises and is especially desirous of not only furnishing loans to already established Japanese companies, but of undertaking business in cooperation with Japanese capitalists in already established or newly promoted companies. It is said that the first scheme of the syndicate is to establish an iron foundry near Osaka at the recommendation of Mr. Matsuaka, Minister of Agriculture and Commerce, and other persons. Several banks interested in the syndicate are reported to have invested capital in various industrial businesses in China and Japan before the organization of the present syndicate. One of the agents for Japan has been engaged in brush and glass manufacture at Osaka for several years past. The capital of the syndicate is said to be a hundred million yen, to be increased after the development of the business.

COLD STORAGE IN JAPAN

Cold Storage, an innovation in Japan until within the last two or three years, has now become a recognized necessity there. One merchant firm in Yokohama has within a year past installed cold storage for the preservation of perishable comestibles, among which are Canadian dairy products. A joint stock company also has entered upon the field on the ground of public accommodation, and has made such progress as to assure facilities for the next warm weather.

A joint stock company is being formed at Tokio, also, with a capital of a million yen, the chief line of its prospective business being to supply Tokio with fresh fish more satisfactorily than at present. The plan is to have the steamers conveying fish from the northern ports equipped with cold storage, whence the fish products will pass into cold storage upon landing, thus preserving the flavor of the fish.

JAPANESE MINING INDUSTRY

According to the report of the Imperial Mining Bureau of Japan the increase in capital invested in mining during the year 1906 in that country as compared with any former year amounted to Yen 79,000,000, and one remarkable feature of mining operations for the year was the great progress made in the introduction of the most modern and technical machinery and advanced processes, so that today the best possible results are being obtained at all the great mineral belts in Japan.

Some idea of the magnitude of the mining operations may be gathered from the following statement made by Chief Isohe of the mining bureau in an interview published in the *Jiyu Tsushin:*

"Last year applications for trial mining were increased by 120 per cent. The product of coal amounted to 13,250,000 tons, that is, an increase of 1,710,000 tons as compared with the previous year, and the product of copper amounted to 61,600,557 pounds, an increase of 5,415,420 pounds. Kerosene oil amounted to about 1,510,000 *koku*, an increase of 320,000 *koku*. The product of iron outside that manufactured by iron works amounted to about 50,040 tons, and 3,200 tons steel, an increase of 3,000 tons. Antimony amounted to 880,000 pounds refined and 160,000 pounds sulphate, an increase of 560,000 pounds for the former and 4,000 pounds for the latter. The product of gold decreased by 250 pounds, silver also decreased by 14,641 pounds. The total value of the product of various metals during last year amounted to *yen* 97,860,000, an increase of *yen* 24,310,000 as compared with the previous year. The number of mining companies newly established during last year is fifty-nine whose capital amounts to *yen* 37,610,000. Those companies increasing capital were nine, the total amount of increased capital being *yen* 18,925,000. Other companies whose objects are to transport or refine minerals newly established or increased capital to the extent of 22,500,000 *yen*."

THE TIMBER INDUSTRY IN MANCHURIA

Mr. Hayashi, Japanese Minister to Peking, paid a visit to H. E. Viceroy Yuan Shih-kai at Tientsin for the purpose of conferring with him regarding the formation of a Chino-Japanese Syndicate for felling lumber on the Chinese side of the Yalu river in Southern Manchuria. The proposed syndicate is to have a capital

of Tls. 5,000,000 to be equally subscribed by Japanese and Chinese timber merchants and others in the two countries. According to a recent joint petition presented to the Chinese Chamber of Commerce at Tientsin by the Chinese timber merchants there, the Chinese portion of the capital has already been subscribed by them for developing the vast lumber trade in South Manchuria. The capital is to be increased to Tls. 10,000,000 if the timber business proves prosperous in future. The Japanese Minister is consulting the Waiwupu at present about the drawing up of the necessary regulations for the proposed syndicate, which is to be managed by an equal number of Japanese and Chinese Directors with equal powers, in order to avoid disputes in future. H. E. Chao, Tartar-General of Fengtien, has wired to the Waiwupu stating that, as the timber enterprise is in South Manchuria, the Chinese timber merchants at Mukden and other places are willing to take part in the trade in the same way as their colleagues in Chihli Province, so that they may share the profits. In view of the increased demand for timber for railway, building and other purposes in the various parts of China at the present moment, the proposed syndicate will surely prove a most profitable concern in course of time if supplied with sufficient capital. It is said the matter may be settled in the not distant future between Japan and China.—*Japan Advertiser.*

AUSTRALIAN WOOL.

The wool season in South Australia in 190 was one of the best on record. There is an increase of over 20,000 bales over 1905. Mail advices to hand from New South Wales state that "there is still a shortage of nearly 70,000 bales of wool in the offerings this season by auction in Sydney, but the number of sheds to be cut out will fully make up for the shortage. Already there is an increase of arrivals of over 50,000 bales."

The future of Queensland as a source of wool supply is most promising. During the drought sheep died off at an appalling rate. In 1896 the aggregate number totalled 19,593,-696, but in 1902 all that could be mustered were 7,213,985. Now, however, a wonderful improvement has taken place, for in 1905 the total had increased to 12,535,231, and to-day it is estimated that the number reaches to between fourteen and fifteen millions. Those persons engaged in sheep-farming are also an increasing quantity, for in 1896 there were 1,664 owners, while in 1905 there were 2,269. During the last ten years the average size of flocks fell from 11,755 to 5,255.

CEYLON PEARL FISHERIES

The total revenue derived from the Ceylon Pearl fishery and camp amounted to $875,392, and expenditure $73,510, and the net profit was $801,882—over $111,000 in excess of that of 1904, which was the previous highest on record. The inspector of pearl banks anticipated an excellent fishery in 1906, but that after a probably small fishery in 1907, and perhaps 1908, another break in the fishery cycle was likely.

A lease of the fishery was given to the Ceylon Co. of Pearl Fishers (Limited), for a period of 20 years from Jan. 1, 1906, for a sum of $103,333 per annum, it being stipulated that a sum should be annually expended by the company upon the improvement of the fishery of not less than $16,666, to be increased at the discretion of the government to any sum not greater than $50,000, and that all the expenses of the supervision and protection of the fishery camp by government should be borne by the company.

It is stated that the Pearl Fishers of Ceylon (Limited) shows a profit of $256,960. Dividends of 36 cents on the ordinary shares and 18 cents on the deferred shares are to be paid; $49,628 is set aside for depreciation and reserve, and $77,382 is to be carried forward.

PAPER MAKING IN BURMA

An investigation has been conducted, under the orders of the Government of India, by Mr. R. W. Sindall, F. C. S., into the conditions under which paper and paper pulp might be manufactured in Burma. Mr. Sindall's report has been published and contains a full account of his experiments and observations. The Government of Burma is now prepared to entertain applications from persons desirous of establishing paper mills. With a view to encouraging a new industry, the following concessions will be granted and agreements will be concluded for a period of 21 years of which the main terms will be as follows:—

(1) No royalty will be charged on bamboos cut and utilized for the manufacture of pulp or paper within the said period of 21 years, or if charged on bamboos cut by contractors and supplied to the paper mill it will be refunded to the owners of the mill. (2) No royalty on manufactured paper stock will be charged for seven years, and thereafter the royalty charged will be Re. 1 per ton or such other rate as may be subsequently decided. (3) If necessary, areas for exclusive cutting of bamboos and suitable fibrous plants will be reserved for paper mills. (4) Suitable sites for the erection of a factory, if available on Government land will be granted rent-free for a period of 21 years subject to such restrictions as may be found necessary. (5) The free use of all roads to and from such a factory will be guaranteed.

On the other hand the Company or other party to the agreement will be bound as follows:—(1) to build a factory within two years from the date of the concession and keep the same working at least 120 days in each year; (2) to produce after the first seven years an annual output of 10,000 tons and after 14 years, an output of 20,000 tons of paper stock per year; (3) to render monthly statements showing the output of the mill each month; (4) to allow a full inspection of all books by the Local Government.

The agreement will be considered null and void if operations are not commenced as provided for in the terms of the concession. Copies of the report of Mr. Sindall on the manufacture of Paper and Paper Pulp in Burma can be purchased from the Superintendent, Government Printing, Burma.

INDIAN RAILWAY EARNINGS

The prosperity of railways in this country, says the *Calcutta Railways*, shows steady advance year by year. Last year, 1905-06, showed an advantage in gross receipts of 95½ lakhs of rupees over the previous year, 1904-05. and the current year 1906-1907 for 10½ months up to the middle of February showed an increase of gross receipts over 1905-06 of 134½ lakhs. By the conclusion of the official year this should easily run up to a million sterling. The East Indian Railway with the vast gross revenue of nearly 702 lakhs is 30 lakhs better than last year, but the North-Western State Railway has done best, having taken more than 47½ lakhs over the previous year's record. The Eastern Bengal State Railway's increase is represented by 27½ lakhs and the Bengal-Nagpur Railway is 13½ lakhs to the good. The surplus of revenue over expenditure after meeting all charges was well over £2,000,000 sterling in the past two years and the Budget will shortly enlighten us as to the balance to be struck in the present year. There is no doubt that the general prosperity of the country is taxing the resources of the leading railways. Increased traffic must necessarily be met with increased facilities for handling it, and all branches of railway working feel the strain. It is to be trusted that the Government will recognise the responsibility and set aside sufficient from the handsome revenue to meet the emergencies that have arisen. Such expenditure will prove productive. In this connection a very striking article appears in the London *Daily Chronicle*. We think the writer in his Radical zeal goes beyond the mark when he declares that the present system of railway administration in India, by which the development of the internal communications of the country rests, not on natural requirements, but on what the Indian Chancellor of the Exchequer may think he is able to spare out of State funds, results in "a crippling of industrial India." But he certainly puts his finger on a weak spot when he points out the disabilities of railway managements in shaping their own requirements with any degree of certainty as to what they are going to get, and also the impossibility under a system of yearly sanctions of looking ahead to any continuity of policy. "It is not possible," says the writer, "under the present system of annual allotment, for the Indian railways to make an intelligent forecast of the improvements necessary beyond the period of one year. No undertaking based on commercial principles can be run on the calendar. If an Indian railway company were to lay before the Government of India at once the full scope and cost of a design for the expansion of its system, in nine cases out of ten the board would be informed that the project was not feasible, because it would cost too much money. Thus works of public utility, designed to greatly develop the natural resources of India and to assist in the diversion of an appreciable section of the population from agriculture to industrial work—the aim of all Viceroys are stifled before they are born. The boards of railway companies in India are prohibited, practically by the nature of their contracts, from taking the responsibility of comprehensive initiative."

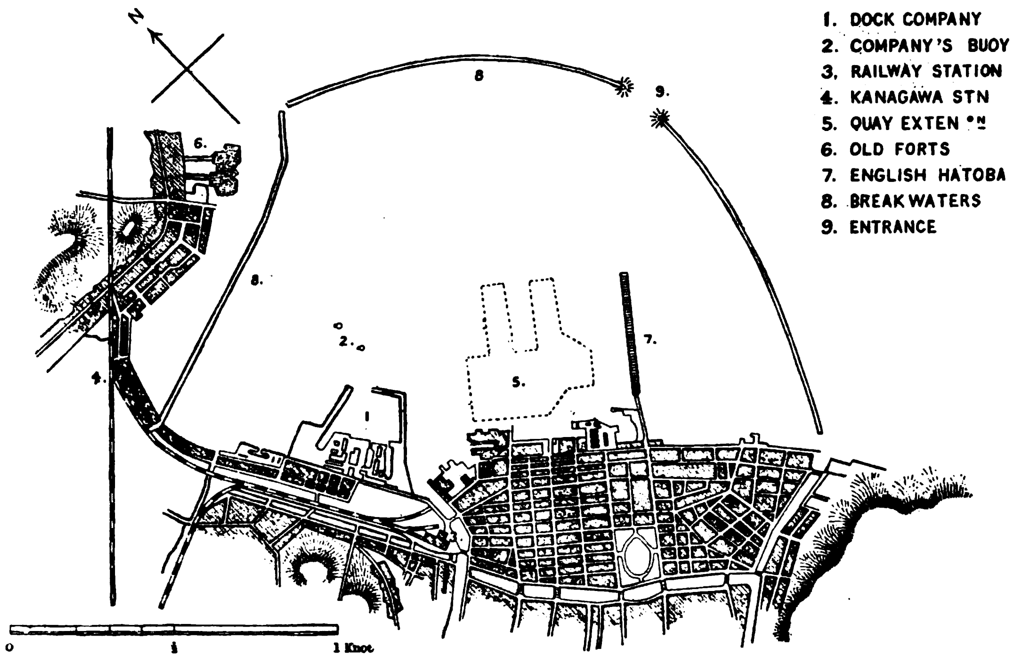
The writer of this article, though well intentioned, has probably not enough experience of Indian railway affairs to understand the peculiar exigencies of the Indian situation—or if he has it is his purpose to conceal it. The Government of India has not been averse to recognising that the railways cannot be superintended in the ordinary secretarial manner by civilians whose claim to omniscience rests upon their having passed an examination in academic subjects. The Railway Board was the outcome of this recognition and in the Railway Board we have embodied practical railway experience. So far so good. It is to be trusted, however, that mere popular clamor from merchants who propose crude remedies without the experience necessary to correct their judgment will not be allowed to shape railway policy. Whenever there is a difficulty in traffic, for instance, the invariable cry of the public is "more railway wagons." The traffic difficulties of getting increased quantities of rolling stock through rapidly and securely without improving traffic arrangements may not appeal to the layman, but to the railway man they are very evident. It is well known that there are long stretches of line on which the traffic arrangements are quite primitive, large numbers of stations that are not interlocked, so that crowding of the traffic must invite disaster, the safety of trains being dependent upon the alertness of the station-masters in charge unaided by the mechanical safety appliances which, by the way, are laid down as indispensable by the Government rules on the subject. There are urgent schemes now on hand for bettering the traffic conditions waiting for nothing but monetary sanction, and it would seem a pity if these are to be hung up in favor of large purchases of rolling stock which cannot be efficiently handled in the absence of more perfect signalling. If the money available be restricted it seems the wiser policy to distribute it equally so that the improvement of the various departments of railway work may go on *im gleichem schritt und tritt* rather than accumulate a mass of rolling stock which will only lead to congestion.

YOKOHAMA HARBOR RECLAMATION WORK

Mr. Tsumaki, Chief of the Temporary Construction Office of the Finance Department, on Sunday afternoon, March 24th, invited a number of members of both Houses of the Imperial Diet and the newspaper representatives of Tokyo and Yokohama for the purpose of showing them the reclamation work now in progress off the Yokohama Customs compound. Under the guidance of Mr. Tsumaki and his colleagues, the visitors were shown over the work, after which a cold collation was served. The work was started in May, 1899, and is expected to be completed in 1910, at an outlay of yen 10,520,000 altogether. Some 1,800 workmen are being employed daily. On completion, 13 steamers representing 54,500 tons will be able to come alongside the reclaimed wharves which will be connected by rail with the Yokohama railway station compound. These steamers comprise one of over 8,000 tons, six of 5,549 tons each, three of 2,895 tons each and three of 1,624 tons each. The reclaimed ground will, when completed, have two arms projecting in parallel lines with the Customs pier, the distance between the two arms being 60 ken. Both arms measure 176 ken by 60 respectively. The ground is already connected with the Nishi Hatoba by a bridge called the Bankoku bashi and will, in future, be connected with the Yokohama Customs compound by another bridge. The water at the wharves on the reclaimed portion varies in depth from 32 to 20 feet at ebb tide, the deepest portion inside the breakwaters being 35 feet. Below is a table showing details:—

Quay-wall	1,134 ken
Berth capacity	13 steamers
Landing space	252 ken
Total area to be reclaimed	68,600 tsubo
Bridges	2
Sheds, wood, (2,014 tsubo)	2
Sheds, iron, (10,710 tsubo)	13
Brick warehouses, three-storied (3,0r97 tsubo)	4
Cranes	35

In addition, six more warehouses will subsequently be constructed on the ground. It may be noted that the Government Iron Foundry at Wakamatsu has supplied and will supply henceforth a quantity of iron materials for the building of the sheds.



YOKOHAMA HARBOR

BREAKWATER

The breakwaters are now undergoing repairs. The eastern breakwater, with white beacon, measures 5,383 feet and the northern breakwater, with red beacon, 6,702 feet. There is also a training wall measuring 6,193 feet, running from the end of the northern break water to Takashimacho where there is the Central Warehousing Company. It may be of some interest to note that the construction work of both breakwaters and training wall is historically connected with Great Britain and the United States, because the work was started in 1889 in accordance with designs drawn by the late Major-General Palmer of England and was finished in 1893. The expenditure required was appropriated from the indemnity which Japan paid to the United States in connection with the Shimonoseki bombardment during the pre-Restoration period and which was afterwards returned to Japan. By the storm of September, 1902, the breakwaters were badly damaged. Repairs were begun last year at an estimated outlay of yen 870,000 and are being pushed forward.

DREDGING

Dredging work within the harbor limits is now in progress. Two dredgers are being employed, one of over 500 tons and the other over 300 tons. The survey of the bottom was finished in 1904 and since then the work has been going on with a view to affording all possible facilities to future shipping. It is expected that on completion of the work the area of the present anchorage will be trebled. The following is a table showing the variation of depths inside the harbor:—

Estimated depth. feet	Estimated area. tsubo	Area dredged. tsubo
35	51,400	49,163
33	96,740	92,740
32	108,640	108,640
30	121,800	330
28	249 720	34,380
24	223,400	97,488
20	145,700	64,233

CAISSON

In conjunction with the dredging work a caisson is also in operation. Just like a diving bell, the caisson is sunk to the bottom, where a number of workmen are at work day and night. The caisson is a large square receptacle of steel, measures 36 feet by 24, and is 13½ feet high. It contains two tube-like openings, through which workmen, with the necessary tools, go down and come up, while ventilation is continually furnished. This caisson was originally designed by the Finance Department and was constructed at the Ishikawajima Shipbuilding Yard several years ago. A noteworthy feature is that the caisson can be used at depths ranging from 24 to 38 feet and can also be removed from one place to another according to the progress of the work.

SPEECH OF MR. TSUMAKI

A speech delivered by Mr. Tsumaki, Chief of the Temporary Construction Office, on the occasion, was in effect as follows:—

After thanking the visitors for the honor shown him in attending the function, Mr. Tsumaki said that it was in the sixth year of Ansei (1859 that Yokohama, which was then a fishing village, was converted into a commercial port. With the repayment by the United States of the Shimonoseki indemnity above referred to, the Tokyo Government had constructed the breakwaters and the Customs pier. Owing to the subsequent development of commerce and navigation it was decided to reclaim a portion of the sea in front of the Yokohama Customs compound. For the sake of convenience, the reclamation work was divided into two sections. Having obtained the consent of the Imperial Diet in 1898 for a disbursement of yen 2,340,000, the reclamation of the first section was at once started and finished by December, 1905. The work on the second section was commenced last year and is still in progress, backed by a fund of yen 8,180,000 which was disbursed by the Diet of 1905. One-third of the above fund was borne by Yokohama City itself. Great credit was due to the late Major-General Palmer of England who had drawn up plans for the constrrction of the breakwaters, the work on which was started in 1889 and finished in 1893. During the terrible typhoon of September, 1902, in which tremendous

waves washed the top of the beacons, the breakwaters were damaged to the extent of over 250 ken. The repairing work was begun last year at an outlay of yen 870,000. The dredging of the harbor was also being carrried on with a disbursement of yen 170,000 annually. The reclamation work and other repairing operations in the harbor were formerly in charge of the Kanagawa Prefectural Office, but were transferred to the Temporary Construction Office in 1903. Mr. Tsumaki ended his remarks by saying that the visit of such enlightened representatives of the people would mark the history of the reclamation work.

THE COWIE HARBOR COAL CO., LTD.

The directors of the Cowie Harbor Co. of N. Borneo concerning whose operations the most satisfactory reports are being received, have recently, without going to the public, made a fresh issue of capital to the extent of £25,000 in £1 shares. We understand that applications have so far exceeded expectations that in allotting the directors have been obliged to very considerably curtail the 5,000 shares that it was wished to reserve for those applying from abroad. There can, we think, be no question that the company possesses a very valuable property, which it is only natural the directors are anxious to lose no time in developing.

The prospectus, which has been privately circulated, states that samples of the coal from the Queen Seam have been analysed by Mr. G. R. Hislop, F. C. S., of Paisley, N. B.; Mr. Benedict Kitto, of London; and Mr. John Parry, of New Port, Mon. Mr. Hislop reports that it is a good steam and coking coal, and the other analysts concur in this opinion. In August last the shareholders were informed that the coal had proved satisfactory for steamer use, and in confirmation of this it may be stated that one of the steamers of the Indo-China Steam Navigation Company, Limited, was supplied with 75 tons, and the chief engineer reported most favorably upon it, estimating its steam qualities as superior to those of other Eastern coals, and characterising it as a "first class steaming coal and very economical." Active development work has been proceeded with at the mine, very satisfactory progress having been made. A tramway has been laid from No. 2 outcrop to a point on the River Silimpopon, some two miles away; wharves are being erected at Sandakan and at Grass Corner, Sebatik Island—the former of which is nearing completion; three lighters, two of 100 tons and one of 350 tons capacity, and a steam launch 40 ft. in length have been constructed. Houses have also been built for the accommodation of the colliery manager and the staff, while the native miners have been well provided for in this respect. It is to extend these operations and properly equip the mine that the present new issue of capital has been made. The money now being raised will therefore be devoted to the following purposes viz.:—(1) The prolongation of the existing tramway to a point in the lower reaches where there is deeper water and where coasting vessels can load. (2) The construction of two or more lighters. (3) The rapid completion of storage depots, loading sites and wharves at Grass Corner, Sebatik Island, and at Sandakan. (4) The increase of the labor force so as to accelerate mining operations. It is confidently expected that the completion of the above works will materially increase the facilities for distribution and also add to the dividend-earning capacity of the company.—*The London and China Express.*

KAWASAKI DOCKYARD CO.

The Kawasaki Dockyard Company of Kobe recently purchased about 30,000 tsubo of land in the neighborhood of the Hyogo Canal, and commenced the construction of a steel foundry. The work has now made much progress, and it is expected that casting operations will be commenced towards the end of this week.

The Kawasaki yard is now building a dispatch-boat of 1,250 tons to the order of the Imperial Navy, two passenger boats for the Nippon Yusen Kaisha, two steamers of 3,500 tons, to be named the Nanyang-maru and Shangyang-maru; two steamers of 2,500 tons the Hosan and Kagi, three passenger steamers of 6,000 tons for the Osaka Shosen Kaisha: three gunboats, the Chucheng, Chuyui and Chukwang, each of 740 tons, three others each of 525 tons, and four torpedo-boats—the Hupeng, Hujung, Hu-ao and Huyen each 96 tons—to the order of the Chinese Government; a destroyer, of 375 tons, and three torpedo boats, each of 96 tons, to the order of the Siamese Government.

MANCHURIAN FLOUR MILLS

During a recent tour of northern Manchuria, Consul-General Thomas Sammons, of Newchwang, found that the capacity of the 20 flour mills in that part of China had an output of upward of 85,000 poods, or approximately 15,300 barrels per day. Mr. Sammons furnishes the following particulars of that flour trade:

At Harbin, where there were six large and six small flour mills, the output was estimated at 45,000 poods (36 pounds to the pood) per day. This industry was established by Russian business men and is growing. It was found that the wheat crop surpasses that of the bean products in marketable value, and that as a result Chinese farmers were, in many instances, giving up the raising of beans and going into the wheat producing business.

Cloth flour sacks are purchased by Manchurian flour-mill operators in lots of from 50,000 to 100,000. The American cotton sack is used. These sacks are not, as a rule, printed in attractive colors, together with the name of the various brands, etc., as is the custom in America. The brand and frequently the name of the miller is stamped on the sack by hand. Many of the mills are operated continuously by three shifts, each shift being on the basis of one Russian to four Chinamen. The cost of wheat following the war ranged high, being 65 kopecks per pood, or about 1 cent gold per pound. The normal price was given as 50 kopecks per pood; total estimated cost per pood, 85 kopecks, 20 kopecks per pood being for labor. It was estimated that 65 per cent of wheat was saved in flour and that the balance sold for 50 per cent of the cost of the wheat—that is, at from 22 to 33 kopecks per pood. There was no waste. Everything is utilized. The wood used for fuel in creating steam power in the mills was considered excessively high, fuel being scarce.

The Russian mill hands were paid 60 and Chinese helpers 18 roubles per month, equivalent to approximately $30 and $9 gold. With two Russian and eight Chinese helpers to each eight-hour shift, one mill turned out in the neighborhood of 2,600 poods of 36 pounds each per day.

SELLING PRICE OF OUTPUT—AMERICAN FLOUR

The flour thus being manufactured was being sold wholesale at from 60 to 95 cents gold per pood of 36 pounds and at retail at from 65 cents to $1 per pood of 36 pounds. The millers complained of the high cost of wheat and the falling price offered for the flour and by-products. During the war high prices prevailed and profits were reported satisfactory, but with decreasing demands and a continuance of war-time prices for wheat the flour manufacturing business was, it was stated, unsatisfactory. Still, new flour mills were contemplated, and those already established were being enlarged in some instances. Russian flour manufacturers stated that they realized that they must adjust their business methods so as to succeed on small profits by increasing their sales.

During the war Pacific coast flour reached the northern Manchurian market via Vladivostok. Large quantities of Pacific coast flour, entering mostly through Newchwang and later through Tairen (Dalny), has been shipped into the interior successfully. The demand is growing rapidly, and the northern Manchurian flour manufacturers report that their output is consumed entirely by the local trade.

ORIENTAL NOTES

By Walter J. Ballard.

Philippine hemp is superior to all known fibres used in the manufacture of ropes and cordages. Last year the islands exported it to the value of $21,750,000 gold, of which the United States took nearly $13,000,000 worth. The total production last year was worth $27,000,000. The other $5,250,000 was used in the islands in making a beautiful cloth combined with Chinese silks. The cloth is woven by thousands of Filipino women in their homes. The new railroads in the Philippines will open up some of the richest hemp districts in the world. Twenty-seven of the thirty-five towns in Ambos Camarines province are entirely supported by the hemp industry.

Surgery is becoming very popular in the Orient. One very notable operation has been cleverly performed by Dr. Mary F. Fitch, the first American lady doctor of Sochowinission Hospital.

China will likely build a railway to the imperial hunting park, about forty "li" outside of Peking, with the object of encouraging foreign and Chinese traders to settle there instead of inside Peking. No compulsion will be used to force those in Peking to go, but future permissions to trade will be granted only for the new place.

Aguinaldo is farming on a large scale in Cavite province, Philippine Islands. Will also take up some of the "friars' lands." Is energetic and ambitious in agriculture, interested in modern machinery and increased production, says *The Seattle Post Intelligence.*

The famous commercial Mitsui family of Japan is forming a spinning and weaving company, with $1,500,000 capital. Headquarters will be in Tokio.

Lumber interests in Negros, Philippine Islands, are developing. One company has two locomotives and six miles of rail on the way from Manila; also $60,000 worth of mill machinery en route from the United States, which will cut 100,000 feet, board measure, a day. The company operates in a magnificent forest, a solid stand of eight miles square of several valuable woods.

The Industrial Bank of Japan, says *The Shanghai Times*, has established an office for the development of three valuable Japanese gold mines. One of them, the Hasami, is reported to be the most valuable gold mining property in the "Chrysanthemum Empire."

China will not allow private persons or companies to establish or maintain telephone systems. All are to belong to the Imperial Chinese telegraph administration.

The city of Tokio, Japan, has borrowed $7,500,000 in London, bearing interest at five per cent., redeemable in twenty years after the first ten years by installments or in one sum, as the city prefers. The issue price was $96½. Japan is very successful in borrowing money easily.

Japan's silk crop is larger this year than last year.

Nagasaki, Moji and other ports are shipping large quantities of cement to San Francisco and Los Angeles.

American calico, hitherto so largerly used in Corea, is being replaced by Japanese makes, says *The Sun Trade Journal*, a monthly in Tokio.

Immediate improvements absolutely necessary to the Manchurian Railway and at the Fushun coal mines, acquired by Japan from Russia, will cost $35,000,000. A further $15,100,000 will be needed later.

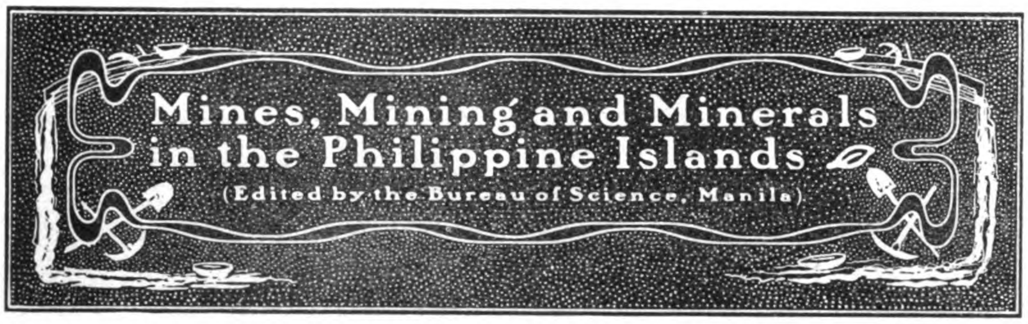
Tokio is to have a great international exposition in 1908, from April to October, inclusive. The cost will be $5,000,000, of which $2,500,000 will be paid by the imperial Japanese government, $1,500,000 by the city of Tokio and the other $1,000,000 will be derived from the sale of tickets, concessions, etc.

New South Wales exported 20,000,000 pounds of butter, valued at $4,090,000, in 1905. In the same year its mineral production was worth $35,000,000.

The Premier of New South Wales wants to engage eight or ten engineers, with salaries ranging up to $5,000 each, for large engineering works.

India's wheat crop is large, 8,560,000 tons, an increase of thirteen per cent. over last year.

The Australian government is planning to engage in the steamship business.



[This department will be a regular feature of THE FAR EASTERN REVIEW *and will prove of general interest and value, especially to the miners of the Philippine Islands. It will contain a variety of reliable articles, observation, and notes concerning the minerals of the archipelago, their development, observations on the mining situation, reports on the progress of development work by private interests, notes of a personal nature dealing with the movements and doings of the miners, and a fund of other useful information all of which is expected in a small way at least to help along mining enterprise. In order to give special weight to the department, as regards accuracy, etc., we have arranged with the Director of the Bureau of Science to have the matter edited by the Chief of the Division of Mines.*—EDITOR'S NOTE.]

OCCURENCE OF PETROLEUM IN THE PHILIPPINES

Petroleum has been found in three places in the Archipelago: one in Tayabas Province, the other two on the island of Cebu; one near the center of the island on the west coast not far from Toledo, the other near the southern extremity, very close to the pueblo of Alegria. At Tayabas and at the first named locality in Cebu some prospecting by means of boring has been carried on, but as yet the Alegria field remains practically unknown. The oil in all three of these localities is found in a bluish shale, presumably of Tertiary age. Taking up these prospects in detail we shall consider Tayabas first on account of its proximity to Manila.

Here two wells have been sunk, one by Mr. Cook on the Viego River (east coast), which is now 70 feet deep, and on the Bayhay River is another well belonging to a different company, which is 130 feet deep. In the latter well, which is about five miles from the coast, the yield at the present time is about fifty gallons per day. The well has a five inch bore and was made with a churn drill.

From report (no representative of this bureau has yet visited this field) formations in this region consist of shale beds inclined at an angle of about 45° to the east. These shale beds are marked by having along the bedding planes thin seams of broken limestone, from ¼ of an inch to 2 inches in thickness, and where these seams are struck there is a notable increase in the oil. This is quite natural, as the shale acts as an impervious stratum, confining the oil so that when one of these fracture zones is encountered oil is found accumulated there. This part of Tayabas Province is practically an anticline of anticlinorium with a limestone of unknown thickness forming its crest. It is quite probable that deeper boring, of say 500 to 1000 feet, would penetrate the entire thickness of the shale and reach a formation more porous, like a sandstone, in which the oil would be found in greater quantities. While I am not at liberty to publish the entire analysis which was made on a sample sent in by a private person, I can say that the oil appears to be of a very good grade. It has a paraffin base, in all probability very like the Sumatran oils, which also have a paraffin base.

In Cebu, near the town of Toledo and about three miles from the coast and just at the edge of the foothills, are located two oil wells, the first to be sunk in the Philippine Archipelago. These are located on the sugar estate of Smith, Bell & Company. These wells are sunk in shaley strata (in all likelihood the same formation as obtains in Tayabas) to the depth, respectively, of 800 and 1130 feet. Very fair shows of oil have been reported from these wells in former years, but at present all operations have been suspended in the district. In fact, nothing has been done in this field since the outbreak of hostilities in 1897, and when the writer visited the field he found the wells choked up with abacá stalks and other refuse material, said by the natives to have been the work of the insurrectos. The elevation of the surface of these wells is 75 feet above the sea-level. There is only one derrick standing now; it is approximately 60 feet high, the borings are 3 inches and the casing 6 inches. The strike of the strata is N 83° W. dip 73° to the south (these figures are taken from the report of the engineer who first examined the field). The drill gear and derrick are from Messrs. Islers, London.

About a mile from the oil well is an outcrop of coal which in former years was worked to some extent, but now is entirely abandoned. From a hasty reconnaissance of the country it is my opinion that the strata are less disturbed in this portion of the island than on the eastern side of the cordillera or to the south, in the vicinity of the Alegria oil field. It is the intention of the Division of Mines to undertake a more detailed survey of this region, with a view to the rapid delimitation of the coal and the oil bearing horizons, after the completion of the present work in the Danao-Compostela coal fields, but not until there are some signs of returning life in the district and interest on the part of capitalists.

At Alegria the oil is found at an elevation of 1150 feet up the Malbog Creek, about a mile and a half in a straight line from the coast. At 1450 feet a bed of poor brown lignite is found. The strata here dip eastward, or into the island, being quite different from what was found in the Toledo field. The rock capping on the surrounding hills is a coralline limestone of probable Pliocene age. The oil here appears to be identical with that from the other two fields and is found oozing out of the same bluish shale. To those intending to explore this field I would recommend that a portable drill be taken just over the divide, about half a mile to the east from the place where the oil at present comes to the surface, to a point where the topography reaches its lowest elevation, as the oil there undoubtedly is moving in that direction through the formation.

From a geological examination of these two fields and from what data I can get on the Tayabas country, I should not expect that any of these fields would support more that half a dozen wells, as there seems to be no great structural reservoirs for the accumulation of any great quantity of petroleum. Faulting and folding of the strata is the rule rather than the exception, in all of these areas, and they are of such a nature that the anticlines and synclines are not very large nor are they likely to be very continuous.

With reference to the likelihood of finding oil on the east coast of Cebu, I might add that although the sedimentary formations are the same, yet a great area of igneous rock which occurs there would cause serious interruption to the oil reservoirs or possibly preclude the formation of them at all. The connection between coal and oil deposits in Cebu and other islands of the group leads me to think that in time oil may be found in paying quantities in many other parts of the Archipelago.

WARREN D. SMITH.

ANNOUNCEMENT

The Division of Mines is contemplating the sending of an expedition during the next five or six months to make a preliminary mineral reconnaissance of Mindanao. This party will consist of one geologist, one mining engineer and one topographer, and it is hoped that the military authorities will co-operate in this work which ought to mean much to the Moro provinces. Besides making geological reconnaissances, route maps, etc., it is the intent of the members of the party to visit every locality where bona fide prospecting and development work has been carried on.

For this reason the chief of the division urges every prospector, who may chance to see this announcement, to leave his name, location of property and all other information that might be of assistance to this party, at military headquarters in the various districts and provinces.

Mindanao has necessarily been long neglected by geologists and mining men, but it is our hope that we may be able to now make amends for this remissness in the past.

TELLURIDE.

The telluride of gold—calaverite,—has been positively determined by the division of mines in some specimens recently brought in by Dr. Fairbanks. The specimens are known to have come from the gold mining district of Southern Lepanto.

This announcement should be of great interest to the mining fraternity, if for no other reason than that it is the first authentic report of telluride in the Philippine Islands.

PERSONAL

Mr. A. P. Wright, who has been prominently associated with Lepanto mining for the last three or four years, returned from the States last month to take charge of the Lepanto Mining Co., during the absence of Mr. Lehlbach.

Mr. C. J. Cooke paid a short visit to Manila last week for the purpose of replenishing his working supplies. He expressed himself as well satisfied with his prospects in the Island of Marinduque.

Messrs. Morgan and Eveland, of the Eastern Mining Co., left for the States in the early part of this month.

Dr. Fairbanks, who is interested in and has prospected some mining property on the Southern border of Lepanto-Bontoc, left for Seattle on the last trip of the *Shawmut*.

He expects to be gone until the end of next year and then return to further develop his prospects.

Mr. J. H. Brown, president of the Automatic Telephone Co., has been making inquiries regarding the location and available supply of cement making material, with an idea of interesting foreign capital in the manufacture of this commodity in the Philippine Islands.

CURRENT NEW YORK WHOLESALE PRICES OF METALS, MINERALS, CHEMICALS, ETC.

Selected from the Engineering and Mining Journal.

ABRASIVES.—		
Bort good drill quality	carat	$ 85.00
Carborundum, grains	lb	.10-.17
Corundum "	"	.07-.10
Emery, grain	"	.035-.045
Pumice Stone, American powdered	100 lbs	1.60-2.00
ACIDS.—		
Hydrochloric 20°	lb	1.25-1.50
Nitric, 38°	"	4.25-4.625
Sulphuric, 66° bulk	ton	18.00-20.00
Aluminum, 99%	lb	.36-.39
Antimony, needle	"	.135-.14
Arsenic, white	"	.07¾-.08
ASBESTOS.—		
No. 1, crude	sh. ton	223.00
Fiber No. 2, paper stock	"	17.20
ASPHALTUM.—		
Trinidad	ton	30.00-40.00
California	"	20.00-30.00
Bleaching powder, 35%	100 lb	1.30-1.50
Blue Vitriol		7.25
Bone Ash	lb	.02¾-.03
Borax	"	.07¼-.07¾
*Caps detonating	M	7.50
CEMENT.—		
Portland, American	500 lbs. bbl	1.55-160
Foreign	"	2.25-2.90
Rosendale	300 "	.85
*Green Island	375 lb. bbl	2.50
*Alsen		2.62½

Clay, China.—		
American common	lg. ton	8.00-9.00
Foreign	"	11.50-17.50
Copper	lb	.24¾-.25¼
*Dynamite 40%	"	.22½
Feldspar ground best	sh. ton	7.00-15.00
Fire brick, American	M	30.00-40.00
Imported	"	26.00-45.00
Fire clay, St. Louis Mill	ton	2.50
*Fuse-Blasting	1,000 ft	7.50
Graphite—American ore, common	lb	.01-.10
Artificial	lb	.06
Gypsum-Fertilizer	lg. ton	7.00
Rock	lg. ton	4.00
Lead	lb	.06
Magnesite—Greece, crude, 95%	lg. ton	7.00-8.00
Bricks, domes	per M	160-200
Manganese, pure, 98-99%	lb	.75
Ore, 80-85%	sh. ton	27.00-35.00
Mercury, export flask	75 lbs	37.00-37.50
Paints and Colors.—		
Litharge, American P'w'd	lb	.07¼-.07½
Ochre, Am. Com	sh. ton	8.50-9.00
Paris Green, pure, bulk	lb	.21-.23
Turpentine, spirits, bbl	gal	.70-.71
White lead, Am. dry	lb	.06¾-.06½
Am. in Oil	"	.07-.07½
Zinc, white, Am. extra dry	"	.05⅜-.05½
Phosphates, Acid	per unit	.65-.67½
Florida hard rock	lg. ton	7.50
Land pebble 68%	"	4.50
Potassium Cyanide (98-99%)	lb	.18-.19
Platinum	Oz	38.00-41.00
*Powder black blasting	lb	.13
*Judson	"	.13½
Pyrite, Domestic Non-arsenical, lump	unit	.11-.11½
Imported non-arsenical lump	"	.13-.13½
Imported, arsenical	"	.12-.12½
Silica, Lump quartz	sh. ton	2.50-4.00
Ground quartz, ordinary	"	13.00-15.00
Glass sand, ordinary	"	2.75
Silver	Oz	.69
Sodium cyanide (100% KCN)	lb	.18-.19
Saltpeter crude	100 lbs	3.75-4.00
*Steel, octagon drill	lb	.15
Sulphur, Louisiana prime	lg. ton	22.12-22.50
Roll	100 lbs	1.85-2.15
Flowers sublimed	"	2.20-2.60
Talc—Domestic	sh. ton	15.00-20.00
Italian, best	"	35.00-40.00
Tin	lb	.41¾-.42
Zinc, metallic ch. pure	"	.15
Dust	"	.05¾-.06¼

*Manila quotation.

JUTE GROWING

Consul E. H. Dennison, of Bombay, reports that there are two questions in connection with the jute industry of India occupying the serious attention of the Indian government, namely, the extension of its cultivation and the proper means to pursue to check adulteration. The consul continues:

In spite of the fact that the area under jute cultivation has increased over 40 per cent in the last decade, nevertheless the demand has always exceeded the supply, owing to the numerous and ever-increasing applications of the jute fiber, due to its comparative cheapness. As a result prices have risen over 40 per cent in the last five years, and have made its adulteration a most profitable business, buyers being unable to protect themselves against this fraud so flagrantly practiced, the jute frequently being watered up to 30 per cent, sand also being used for adulteration.

The jute-producing districts at present are restricted to the provinces of Bengal and eastern Bengal, and it is said that these will soon have reached the limit of their productive power, and that they will be utterly unable to keep pace with the enormous increase demanded. Investigations have been conducted by the government with a view of finding other districts outside of these provinces which would be adaptable to jute production. There are several districts where the temperature, soil, and rainfall or water supply are similar to the great producing districts of Bengal, such as Malabar, South Kanara, and Ganjam, in the Madras Presidency, and the irrigated district around Poona, in the Bombay Presidency. What will be the result if experiments are tried is impossible to say, but in the event of failure, the plan of finding substitutes offers a most attractive field.

India is rich in fiber-producing plants, it being estimated that at least thirty of these are capable of commercial exploitation. It is hoped that investigation will prove that some of these will be discovered to possess properties equal to those of jute, or at least capable of being substituted for jute for some of the purposes to which that article is put. Experts are of the opinion that the most suitable substitute is *Hibiscus cannabinus*, otherwise known as "Bimlipatam jute," the cultivation of which is chiefly confined to the Madras Presidency. The high price of jute has stimulated this industry, the acreage of which rose from 37,171 acres in 1905, with a fiber output of 80,000 bales, to 68,201 acres in 1906. Its spinning qualities are, however, not so good as jute, but it can be used in place of jute for many purposes.

The adulteration of jute has been the subject of a petition from the Bengal Chamber of Commerce to the government of Eastern Bengal, praying for legislative interference. It has been suggested that an effective way to prevent this adulteration is by the extension of the area cultivated or by increasing the yield per acre.

THE PRESERVATION OF MINE TIMBERS

The experiment carried on during the past few months by the Philadelphia and Reading Coal and Iron Co. under the direction of a member of the U. S. Forest Service, has demonstrated that the preservation of mine props can be put on a firm commercial basis.

In the loss of mine timbers at least 60% are destroyed by decay and the remainder by crushing. The percentage charged to decay should be even higher, because many of the timbers which break have already been weakened by decay. Decay is probably the cause of 75% of all failures in mine timbers. The decay in props is principally caused by wood-destroying fungi. Warm, moist air, together with certain gases, found in mines, greatly favors the development of these fungi. Ventilation is an enormous factor. Timber in the vicinity of shafts and slopes where there is abundance of fresh air lasts longer than that deeper in the mines. The variation of moisture and temperature within mines is so wide that timbers may decay in eight months or may last several years. Timbers that are constantly wet or constantly dry last longer than those subjected to an alternation of these conditions.

Various materials and methods for preservative treatment have been tried, and up to the present time all have proved efficient. Only time will show which are the most satisfactory from the practical point of view. Applied with a brush, creosote and carbolineum give an excellent penetration in solid wood, frequently averaging from ¼-in to ½-in. Little difference in penetration has as yet been noted between creosote and carbolineum, though the latter seems better on absolutely green timber. All brush treatments were applied hot and in two coats. The second coat absorbed practically as much oil as the first.

Open-tank treatment has succeeded beyond all expectations. This consists of an immersion of the timbers for several hours in preservative and then allowing them to cool to atmospheric temperature. While the feasibility of the open-tank treatment has been demonstrated, there is much yet to be learned. The cost may be reduced by shortening the immersion and thus consuming less fluid. A very heavy treatment is not necessary. Seasoned and treated props, which were put in alongside of the old-style props, unseasoned and unpeeled, are as sound as ever, while the others are already showing signs of fungous growth and decay.

Most of the props in the collieries investigated are loblolly pine; Pennsylvania pitch pine furnishes 20%; black and red oak, 10%. The loblolly pine comes from Maryland and Virginia, the pitch pine from north-central Pennsylvania, and the oak largely from New Jersey and Pennsylvania. The experiments have been mainly on loblolly pine, the wood most used.—*Engineering News*.

HEMP STATISTICS, MAY 1st, 1907

(Courtesy of C. N. Nicholson, *Secretary Manila Chamber of Commerce.)*

Arrivals of hemp at Manila up to 30 April		237,992 *Bales.*
Arrivals of hemp at Cebu up to 30 April		69,030 *Bales.*
Arrivals of hemp at all Ports up to 30 April		307,022 *Bales.*
Stocks on hand in Manila and Cebu on 1st January 1907		63,432 *Bales.*
Total		370,454 *Bales.*
Export to all parts to date 30-3-07	268,603 *Bales.*	
Local consumption estimated at	6,875 "	275,478 *Bales.*
Total stocks at Manila and Cebu on 1st May 1907		94,976 *Bales*

EXPORT OF HEMP, APRIL 1907.

Date	Vessel	London	L'pool	Atlantic U. S.	Pacific East & California	Australia	Other pts.	Total Bales
	F'wd:—	73,600	20,586	67,396	3,000	1,715	15,527	181,024
Apr. 2	Taming	250	250					500
" 4	Slavonia						1,202	1,202
" 5	Loongsang						150	150
" "	Zafiro	200			2,075		1,050	3,325
" 7	Manila						71	71
" "	Palma ......Cebu	5,164	1,350					6,514
" 8	Indrapura			16,937				16,937
" 9	Tean	50			648			698
" 11	Lyra				5,400		1,141	6,541
" 12	Yuengsang	6			527			533
" 13	Rubi	900					251	1,151
" "	Sungkiang ......Cebu						150	150
" 16	Alicante	2,000	2,000					4,000
" "	Taming	150						150
" 18	Kouang Si	7,612					450	8,062
" 19	Zafiro						1,054	1,054
" "	Jesseric			8,182				8,182
" "	Kaifong ......Cebu						50	50
" 22	Yawata Maru					1,600		1,600
" 25	Norman Prince						100	100
" 26	Rubi	800					800	1,600
" 27	St. George			9,920				9,920
" "	Suevia						1,100	1,100
" "	Jason ......Cebu	4,241						4,241
" "	Jesseric ......do.			8,538				8,535
" 29	Prinz Waldemar						160	160
" 30	Eastern						250	250
	Total	94,973	24,186	110,973	11,650	3,315	23,506	268,603

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

YOKOHAMA ELECTRIC LIGHT CO.—The Yokohama and Kanagawa Electric Light Companies have amalgamated under the name of the Yokohama Electric Light Co.

CAWNPORE ELECTRIC STREET RAILWAY.—The Indian Electric Supply and Traction Co. opened the new system in Cawnpore to traffic last month. The system was inaugurated by giving the public the privilege of riding free for two days.

KIRIN ELECTRIC LIGHT PLANT.—A charter for an electric light company with a capital of Tls. 200,000 has been secured by a German merchant of Kirin. It is the purpose of the company to supply the city of Kirin with light and power.

ELECTRIC LIGHT FOR ESSENDON.—The municipal council of Essendon, a northern suburb of Melbourne, has accepted the offer of the North Melbourne Electric Tramways and Light Co. to install 450 32 candle power lamps at £2 10s each per annum.

AKASHI-MIKI ELECTRIC TRAMWAY.—A syndicate known as the Denki Tetsudo Kabushiki Kaisha, capitalized at Yen 500,000, has applied for a franchise to construct and operate an electric tramway between Akashi and Miki in the Kobe prefecture.

NEW ZEALAND TO HARNESS WATER POWER.—The New Zealand government is considering a scheme whereby it proposes to utilize Huka Falls and supply the Auckland District with 76,000 horse power with which to develop electricity for light and power.

JAPANESE ELECTRIC RAILWAYS.—Among the newly organized electric companies in Japan are the Hansei Electric Railway Company which is to build a new 5-mile line at Osaka at a cost of $1,250,000 and the Kobe-Takarazuka Electric Railway Company, capital $1,250,000.

TAMAGAWA ELECTRIC RAILWAY.—The Tamagawa Electric Railway was opened for traffic April 7. This line connects the cities of Dogenzak and Tamagawa by way of Sangenjaya a distance of over five miles. The line is divided into four sections and the fare fixed at four sen per section.

UNDERGROUND RAILWAYS IN JAPAN.—A company capitalized at Yen 15,000,000 has been organized at Tokio for the purpose of putting in twelve miles of underground track the system to be operated by electricity. In this connection similar projects have been reported from other cities of Japan.

PROPOSED ELECTRIC TRAMS FOR PEKING.—Taotai Hwang Kai-wen, Director of the Peking Telegraph and Telephone offices, has sent in a petition to the Boardof Posts and Communications, and of Agriculture, Works, and Commerce requesting permission to build an electric tramway after the same methods as the Tientsin Trams, with Chinese money.

JAPAN GOVERNMENT TO TRY ELECTRIC POWER ON RAILROADS.—It is the purpose of the Tokio government to use electric power on some of the government railroads and a test will be made by introducing it on the roads Kodzo and Yokohama, Yokohama and Shimbashi, and Shimbashi and Uyeno, forming a semicircle about Tokio. If the trial proves satisfactory the use of electricity will be extended.

ELECTRIC POWER TO DISPLACE STEAM.—It is reported that the work of making necessary additional arrangements on the present railway between Yokohama and Kodzu for the purpose of running electric cars in addition to steam trains will be commenced in August or September this year. It is reported that one new line will be laid on the above section. Electric car traffic will begin in March or April next year.—*Japan Advertiser.*

UNDERGROUND WIRING IN WESTERN AUSTRALIA.—The postal authorities of the city of Perth, Western Australia, have let the contract for 3300 conduits with six ducts each and 1380 conduits with four ducts each to be installed from two to three feet underground and encased in a bed of concrete. This is the first contract let and tenders for another supply have been invited. These conduits will place all the telephone wires underground.

NEWCASTLE (N. S. W.) TRAMWAYS.—About 30 miles of tramway construction will feature the public utility improvements of Newcastle (N. S. W.) this year. The contract for the construction of an extension of the main system of the city to the race course has been awarded and work on the twenty mile line connecting East and West Maitland has been commenced. In addition to these contracts the Works Committee are considering the extension of the Newcastle system to West Wallsend, a distance of about six miles.

ELECTRIC POWER FOR ADELAIDE TRAMWAYS.—The Government of South Australia took over the horse tramways of Adelaide in February and later turned them over to the Municipal Tramways Trust, a corporation composed of representatives of the state and of the various municipal authorities concerned. The price paid by the State was £280,000, an amount less than the original cost of the lines involved. It is the purpose of the State to substitute electricity for horse power at an early date and reorganize the entire system.

MADRAS ELECTRIC SUPPLY CO.—In connection with the plant which Messrs. Crompton and Co. are erecting for the Madras Electric Supply Corporation Ltd., it is stated that the general supply will be available for lighting and punkah fans and motors and will be on the low pressure direct current three-wire system, the consumers being supplied at 225 volts or 450 volts. To meet the demand for current in bulk for mills, factories and large consumers in or near the town, three-phase current will be generated at 5,000 volts, and delivered to consumers at that pressure and converted by means of transformers to suit their special requirements. A substation will be installed which will be from the high pressure alternating plant at 5,000 volts, the current being converted into low pressure continuous current and distributed from the sub-station at 225 or 450 volts. This sub-station is necessary from the fact that the supply area is approximately 26½ square miles. Further sub-stations will be ereced as required by the demand upon the supply. The Main Generating Station is being erected on a portion of the site of the old Municipal Sewage Farm now disused—the position being well situated as far as the supply of water and coal is concerned, a very important point. The direct current plant to be installed will consist of two 250 and three 500 kilowatt continnous current steam dynamos. This is equal to about 100,000 lamps or their equivalent, connected to the mains. The high pressure alternating current plant for the bulk supply will consist of two 250 and two 500 kilowatt three-phase high tension steam alternators. The steam for driving the plant will be derived from five water tube boilers with electrically-driven chain grate stokers. Each engine will have its own electrically-driven surface condensing plant and four electrically driven boiler feed pumps will be installed. The Generating Station will be of the most modern design and complete with coal conveying plant, two 20-ton travellers and water storage and purifying plant. The total amount of cable to be laid, including distributors and feeders, high and low tension, is approximately 54 miles.—*Eastern Engineer.*

RAILWAYS AND RAILWAY SUPPLIES

SOUTH MANCHURIAN RAILWAY CO.—Debentures to the amount of £80,000 will shortly be placed on the market in New York.

KAIFENG-CHENGCHOU RAILWAY.—Traffic on the Kaifeng-Chengchou section of the Honan Railway was inaugurated April 16.

SOUTHERN MAHRATTA RAILWAY.—The Miraj-Sangli branch of the Southern Mahratta Railway in India was opened for traffic April first.

KAIFENG-FU-LOKYANG RAILWAY.—The Chinese foreign office is arranging for a Belgian loan to build a railroad from Kaifeng-fu to Lokyang.

KIRIN-CHANGCHIN RAILWAY.—A lot has been selected by the management of the road about a mile north-east of the town of Changchun as a site for a railroad station.

KING-CHANG RAILWAY.—An effort is being made at Peking to float a loan in Europe for $10,000,000 to be used in constructing the King-Chang Railway and to build an arsenal.

AUSTRALIAN RAILROAD SLEEPERS:—An order has been placed in Australia by the North Western Railway of India for the delivery of 400,000 sleepers and 9,000 bridge timbers.

NINGPO-HANGCHOW RAILWAY.—French capitalists have made application to the governor of Chekang for a concession to build and operate a railroad from Ningpo to Hangchow.

TSITSIHAR-AIGUN RAILWAY.—The Tartar General of Heilungkiang has dispatched representatives to Harbin to purchase sleepers for the new road the survey of which has been concluded.

KIRIN-CHANGCHUN RAILWAY.—The military governor of Kirin has refused the offer of the Japanese and Russian Consuls to supply the capital necessary to construct the Kirin-Changchun Railway.

SHANTUNG RAILWAY.—The governor of Shantung is semi-officially reported to have granted a concession to a German syndicate to construct a railway from Yihsien to the Tienchuang river.

KUEICHUA-KALGAN RAILWAY.—With three million taels subscribed by the rich secretary of the railroad board, the Kueichua-Kalgan Railway management has decided to proceed with the construction.

AMUR RAILROAD BRIDGE.—The site of the railroad bridge over the Amur River has been decided upon and construction begun. The contractors propose completing this important construction by the end of the year.

BURMA RAILWAY EXTENSION.—The lieutenant governor of Burma announces that a railway will soon be built from Kawakareik to Myawaddi on the Siamese border. The survey of the line has already been commenced.

MANCHURIAN RAILWAY TO HAVE DOUBLE TRACK.—The survey of the Southern Railway for the purpose of doubling the track was commenced March 20. I was expected that the laying of steel would begin abou May first.

SHWEBO-YE-U RAILWAY.—The Burma Railways Company has secured permission from the government of Burma to complete the survey of a proposed line to extend from Shwebo on the Mu Valley Railway to Ye-U, a distance of 22 miles.

KIRIN-CHANGCHUNG RAILWAY.—The sum of Tls. 4,000,000 has been subscribed by the Taotai Sung Chun-so for the construction of the proposed railroad between these two points. It is said that half of this sum came from Russian sources.

KIACHOW-CHINANFU RAILWAY.—The governor of Shantung has granted a franchise to the Kiachow-Chinan-fu Railway to construct a branch from Yih-hsieno to Tien-Chwang-ho. The prospectus and estimates have been submitted for approval.

YI-HSIEN AND GRAND CANAL RAILWAY.—The Peking government has granted the salt taotai, Chang Lien-fu, a concession for a railroad of normal gauge to connect Yi-hsien with the Grand Canal. The contracts for the rolling stock were let at Tsinanfu, March 30.

HANKAKU RAILROAD CO.—The attempt of the directors of this company to increase its stock while the share market was booming failed, and the resolution authorizing this step was rescinded. The shareholders refused to subscribe for the shares allotted to them.

YUNNAN-TIBET RAILWAY.—The Grand Council at Peking has directed that the construction of the Yunnan-Tibet railway must be pushed at once and that no foreign capital must under any circumstances be utilized nor must the contract be let to any foreign syndicate.

PEKING-KALGAN RAILWAY.—The Hongkong and Shanghai Bank has agreed to forward profits of the Peking-Shanghai-Kwan Railway for the use on the Peking-Kalgan Railway Works, but the Board of Communications is strongly opposed to the arrangement.

MANCHURIAN RAILWAY AGREEMENT.—An agreement signed April 14, at Peking, stipulates for the joint laying of the Kirin-Changchun Railway; for the purchase by China of the Hsinmintun-Mukden Railway; and for the investment of Japanese capital in that railway East of the Liaoho.

PROPOSED MANDALAY TRAMWAY.—A company has been formed to construct and operate a steam tramway between Obo and Zegyo in the town of Mandalay, Burma. The promoters agree to pay the municipal authorities an annual track rent ranging from Rs. 250 to Rs. 1,000 a mile.

CHEFOO-PEKING RAILWAY.—The merchants and property owners of Chefoo are advocating a railroad from that port to the Chinese capital. In this Tientsin sees the probable injury of her interests and opposes the project. The matter is to be taken up with the authorities at Peking.

MANILA RAILWAY.—The traffic receipts of the Manila Railway for the week ending March 16 were $54,338 (including extensions, 207 miles open) against $41,627 (main line only, 132 miles open) for the corresponding week of 1906, making an aggregate of $496,810 against $379,222 for last year.

MANILA RAILWAY.—The traffic receipts of the Manila Railway for the week ending March 23rd were $47,979 (including extensions, 207 miles open) against $37,197 (main line only, 172 miles open) for corresponding week last year, making an aggregate of $340,070, against $264,154 for last year.

THE SANDAKAN-MARUDA BAY RAILWAY.—The survey of this proposed line has now reached the east side of Sandakan. The route proposed was by Deep Creek and comes out west of Sandakan but this has been abandoned by the surveyors on account of the hilly character of the ground there.

CANTON-HANKOW RAILWAY.—The management of the Canton-Hankow Railway ordered 54 freight cars from Japan at a cost of $216,700, but discovered later that the price quoted by the Japanese did not include the axles or wheels. As a result the order has been reduced to meet the appropriation.

BURMA RAILWAYS.—Capt. Hearn, R. E., Deputy Consulting Engineer for the Burma Railways, left Rangoon March 20 to inspect the Myawaddi Railway survey and the Pegu-Moulmein extension. Mr. Mills, Chief Consulting Engineer for Construction, is going to meet Capt. Hearn.—*Rangoon Times.*

MUKDEN-HSINMINGTUN RAILWAY.—Viceroy Yuan Shih-kai has memorialized the Throne that the profit of the Chinese Railways within and without the Great Wall should be appropriated to cover the expenses of the proposed railway between Mukden and Hsinmintun. The proposal has received imperial sanction.

DOUBLE TRACK ON TOKAIDO RAILWAY.—The work of doubling the railway on Biwashima-Kiyosu and Yaizu-Shimada sections of the Tokaido line has been finished and the lines open to traffic. Okazaki-Ofu and Ofu-Atsuta sections of the same line are also expected to be completed before long.

East Indian Railway.—The construction of the Khurja-Hapur branch of the East Indian Railway is almost complete and in a short time it will be thrown open. This branch connects the Moradabad-Ghasibad section of the Oudh and Rohilkund Railway at Hapur with the main line of the East India at Khurja.

Szechuen-Tibet and Yunnan-Szechuen Railways.—The Chinese landowners of the provinces of Szechuen and Yunnan intend to forestall British enterprise by building the Szechuen-Tibet Railway with Chinese capital. The native capitalists are also interested in a projected line between Chengtu and Western Yunnan.

Chihli-Shantung Railways.—The viceroy of Chihli has been in communication with the viceroy of Shantung on the subject of constructing a railroad about 400 li to connect Shanteh in Chihli with Chinanfu in Shantung. It is reported that an agreement has been reached and that the survey of the proposed line will begin at once.

Tientsin-Chinkiang Concession.—There is a prospect that the application for a franchise by an Anglo-German Co. to construct a railway between Tientsin and Chingkiang will be favorably considered by the Peking government. A memorial signed by the leading officials of Chili, Shantun and Kiangsu has been submitted to the throne.

Manila Railway.—The traffic receipts of the Manila Railway for the week ending March 30th were $19,112 (including extensions, 207 miles open), against $10,854 (main line only, 132 miles open) for the corresponding week of 1906; making an aggregate of $599,490 against $451,376 for last year.—*London and China Express.*

Chinese Trunk Lines.—The departments of Communications and Posts have recommended to the Empress Dowager that extensive trunk lines of railroads be built throughout the Chinese Empire. The Empress Dowager directed that a complete railway map of the empire be submitted with the proposed trunk lines indicated thereon.

Yihsien-Tienchuang Railway.—The Chinese-German Coal Mining Company is busy surveying a line 90 li in length connecting Yihsien and Tienchunag in Shantung to be built at an estimated cost of 900,000 Tls. An order for material has been placed with a German firm. The road will be used exclusively for the transportation of coal.

Tramway Extension to Baranagore.—At a meeting of the Cossipore-Chitpur Municipal Commissioners held the other day the necessary agreement *re* tramway extension to Baranagore between the Calcutta Tramway Co., Ltd., and the Commissioners was approved and forwarded to Government for final orders.—*The Bengalee, March* 23, *Calcutta.*

Bhamo-Tenne Railway.—To tap the trade of Tibet and divert it from the Tonkin Railway is the purpose of a British syndicate that has invaded Yunnan. This line will be in a position to supply the country in and about Tibet and carry all the cotton grown in the Upper Yunnan to Bhamo to market. Bhamo is situated on the boundary of British Burma.

Kowloon-Canton Railway Loan.—A dispatch from London states that subscriptions are being invited for a Chinese Imperial Railway loan for the construction of the Chinese section of the Kowloon-Canton line.

The amount of the loan required is £1,500,000 at 5 per cent issuable at par and redeemable in 30 years.

The Yunnan Railway.—The Yunnan Railway construction is progressing slowly owing the scarcity of the labor, through the inability of the natives of the province of Szechuan, who make up the greater part of the labor, to stand the rigors of the northern climate. However, the railroad authorities expect to reach the Chinese treaty port of Mongtse about the middle of January.

Shanghai-Nanking Railway. — New passenger coaches have been put on the Shanghai-Nanking Railway and the fare has been reduced one-half. The management has introduced the American check system in the baggage department, which has proved a welcome innovation. Four pieces of baggage are allowed each passenger and porters are supplied at each station who atend to the transfer at two cents per passenger.

Manchurian Railway Junction.—The *Mainichi Dempo* states that the junction of the Russian and Japanese lines in northern Manchuria is to be at Palipao, This place lies on the Chuangchun-Kilin high road. which, setting out from Kilin, runs nearly due West to Changchun, thence to Wutipao, and thence to the railway, which it crosses and enters Palipao. The last-named place lies 4 miles north of Menkiatun and about 2 miles south of Kwanchengtsz.

American Locomotives Sold Abroad.—The American Locomotive Co. has received the following orders for locomotives for delivery in foreign countries: Two eight-wheel passenger locomotives for the Canton-Hankow Railway, China; three prairie type tank locomotives for the Yueh Han Railway, China; five prairie type tank locomotives for the Yokohama Railway of Japan; two four-wheel type saddle tank locomotives, government railway of Guatemala, and three mallet type locomotives, Central Railway of Brazil.

Indian Railways.—The following additions were made to the railway system of the United Provinces during the year 1905-06:—*East Indian Railway*:—The Shikohabad Furrukhabad branch, 36½ miles, and the extension of the Etmadpur chord from Satauli to Etmadpur one mile; *Agra Delhi Chord Railway*:—The Sanket branch from Kosi to Sanket, 6 miles; *Bengal and North-Western Railway*:—The Barhni Tulsipur section, 23 miles; *Rohilkhand and Kumaon Railway*:—The Bareilly Soron section, 56 miles.—*The Capital.*

Baikal Ring Railway.—The railroad built by the Russian government around the southern end of Lake Baikal in Eastern Siberia is reported in very bad repair and it will necessitate an outlay of approximately £1,150,000 to put that section in proper shape again. This road is about 162 miles in length and cost the Russians the sum of £4,250,000. When the war broke out the construction of part of it was rushed and the consequence was that it was very poorly built and will have to be gone over again. The cement and other materials proved very inferior.

Patent Voucher Block Instrument Adopted.—The *Calcutta Railways* announces that the Indian railways generally have adopted the Neale Patent Voucher Block Instrument. In fact the Railway board has issued a circular to all railways in India calling attention to the new device with a view to giving it a trial. It has been already adopted by the East Indian Railway, Great Indian Peninsula Railway, Bengal-Nagpur Railway, Burma Railways, Oudh and Rohilkhand Railway, and we understand the Eastern Bengal State Railway has decided in its favor.

Southern Punjab Railway.—The total approximate earnings of the Southern Punjab Railway for week ending 2nd March, 1907, were Rs. 75,220, against the audited figures of Rs. 84,035 for the corresponding week of the previous year. Those of the Ludhiana Extension were Rs. 11,309, against Rs. 7,989. The total approximate earnings of the Southern Punjab Railway for week ending 23rd February, 1907, were Rs. 82,487, against the audited figures of Rs. 1,02,029 for the corresponding week of the previous year. Those of the Ludhiana Extension were Rs. 12,343, against Rs. 12,222.—*Railways.*

Kirin-Heilungkiang Railway.—A protest has been filed by the Russians against the proposed construction of a railroad from Kirin to the north of Heilungkiang and connecting the latter place with Sanhsing, a project that has been set on foot by the Chinese government. The Russians claim that they have a right by a former agreement with China to participate equally with the Chinese government in the construction and operation of railways in that part of Chinese territory and further claim that with China in complete control of the proposed road the interests of the Eastern Manchurian Railway would be seriously affected.

Ceylon Railroads.—The following resolution was moved at the Annual Meeting of the Ceylon Chamber of Commerce, held at Colombo on the 26th ultimo:—That this Chamber views with great apprehension and regret the long and unwarrantable delays that are taking place on the part of the Right Hon'ble the Secretary of State for the Colonies, in connection with the schemes relating to the Ratnapura Railway, the Passara Extension, and the Manaar Branch Railway, for the construction of all of which, immediate sanction is urgently necessary in the interests of the Colony, and they desire that the strongest possible remonstrance be made to the Colonial Office on the subject."—*Railways.*

Manchuria Railway Development.—The correspondent of the *North China News* writes under date of April 17.—The purchase price of the Hsinmintun-Mukden railway is Yen 1,660,000.

Half the capital of the Hsinmintun-Mukden and Changchun-Kirin railways will be borrowed from the South Manchuria Railway Company. The term of the loan for the Hsinmintun railway will be eighteen years and of the Chang-chun Railway twenty years, and the amounts will be unredeemable until the full expiration of those terms. The chief engineers and accountants are to be Japanese, who will have full responsibility for the lines.

Indian Railway Extension.—It is officially anticipated that during the year 1907-08 a total of 832.02 miles of new railway will be opened for public traffic in India. Of the total mileage 171.73 miles will be on the 5′ 6″ gauge; 473.76 miles on the 3′ 3⅜″ gauge; and 186.53 miles on special (2′ 6″ and 2′ 0″) gauges. The Railway System and Railways contributing to the total mileage in varying proportions are the following:—Eastern Bengal, Nagda-Muttra, North Western, Bengal-Nagpur, East India, Great Indian Peninsula, Assam Bengal, Burma Railways, Nilgiri Railway; Bezwada-Masulipatam Railway, Rohilkhand and Kumaon, Gackwars Mehsana, Jaipur Railway, Purulia-Ranchi Railway, Shahdara (Delhi), Saharanpur Light-Railway, Dholpur-Bari Railway.—*Capital.*

The Kowloon-Canton Railway.—The work on this railway is being pressed forward apace, and much real work has already been done. The real piece of work which is now to be attacked in earnest is the boring of the tunnel through the range of hills that rises behind the Kowloon Hinterland. This has been already begun, but the nature of the rock met with has proved that the task will not be an easy one. Big granite boulders are being met with, and these lie embedded in masses of decayed granite, so that a good deal of timbering has to be done to keep everything safe whilst blasting is going on. On the other hand, gangs of coolies are at work and these have already built much of the line on the south side of the hills, and they are also at work on the north side, so that there are really three parts of the line being worked at one and the same time.—*N. C. Daily News.*

Tsitsihar-Aigun Railway.—The Tartar General of Heilungkiang or the Amur province has completed arrangements for the construction of a railway which will connect Tsitsihar, the capital, with the city of Aigun in the same province. Two million taels have been subscribed by the merchants and landowners of the Amur province and there is every indication that the road will be built in its entirety by local capital. In fact Tartar General Cheng-Teh-ch'uan has filed a protest with the authorities at Peking against permitting the Russians to have any hand in the construction or the direction of the road. At the present time all the sleepers needed for the proposed line are being cut from the great forest of the province and a large contract for rails and other materials has been placed with the Hanyang Steel and Iron Works of Hankow. The surveyors have reached a point called Yachau, about twenty miles from the capital. Construction work will be commenced at once.

Railway Bank for Szechuan.—H. E. Hsi Liang, retiring Viceroy of Sze-chuan, has memorialized the Throne respecting the establishment of a railway Bank at Chengtu to have charge of the financial affairs in connection with the building of the proposed Chuan Han or Szechuan-Hankow trunk line, with pure Chinese funds.

According to the memorial, the railway company has already subscribed about Tls. 7,000,000 from the native gentry, merchants and others in Sze-chuan province.

As this money is quite sufficient for the construction of the first section from Chengtu to the treaty port of Chungking, the memorialist anticipates that the constructional work may be commenced within the course of May, of the current year, without further delay so that the rich and vast province of Sze-chuan may be connected with the other Yangtsze provinces by railroad, for facilitating communications in the course of the next few years.

Railway Equipment.—Foreign trade opportunity No. 750 stated that, according to official advices received by the Department of State, the South Manchuria Railway Company, which is under the direction of the Japanese Government, had decided to adopt the American system, and to place large orders for materials in the United States as an expression of appreciation of America's friendly attitude toward Japan. The Department of State has now received a dispatch on this subject from Ambassador Wright, of Tokyo, stating that he has been informed that the South Manchuria Railway Company will require one hundred and fifty (150) locomotives, besides rolling stock and other supplies, which in all will aggregate in the neighborhood of ten million yen (about $5,000,000) Two firms in Japan that represent American locomotive works and manufacturers of railway supplies have been furnished with specifications for the purpose of presenting bids. The addresses of these will be supplied to inquirers by the Bureau of Manufactures.

PUBLIC AND PORT WORKS, WHARVES, ETC.

Uno Harbor Works.—The inauguration ceremony of the Uno Harbor works, Japan, took place last month. The work will extend over three years and the estimated cost is Yen 338,757.

Calcutta Cement Contract.—Messrs. Balmer, Lawrie & Co. have been awarded the contract to supply 5,000 barrels of cement by the Calcutta Port Works. The price is Rs. 33,437-8-0. The Gillingham brand was selected.

Burma Canals.—Provision has been made for working expenses on the Shwebo Canal. The expenditure on construction on Burma Canals during 1907-08 will be as follows:—Shwebo Canal Rs. 1,99,000; Mon Canals, Rs. 7,83,000; Yeu Canal, Rs. 18,000.

Tokio Harbor Works.—The Japanese government is arranging for a foreign loan of twenty million yen in order to carry out the projected harbor works construction at Tokio. It is understood that the loan will be placed through the Industrial Bank at Tokio.

Indian Irrigation.—The total canal irrigated area of the spring crops of the Punjab to end of February is returned as 4,835,947 acres as against 4,382,386 acres in the corresponding period of 1906. The large increase in area this year is shared mainly by wheat, sugar-cane, gram and winter oilseeds.—*Capital.*

Town Hall for Yokohama.—The residents of Yokohama are considering the proposal to build a three storied building on the site of the old building which was burned, at a cost of a million yen. It will be indicated as a monument commemorating the fiftieth anniversary of the opening of the port of Yokohama to foreign trade.

Yokohama Waterworks Extension.—The municipal authorities of Yokohama are contemplating the enlargement of the present system of reservoirs so as to increase the capacity to take care of a population of one million persons. It is proposed to tunnel a distance of three miles to the upper part of the Doshi River for the new supply.

Straits Settlements Waterworks.—The Straits Settlements *Government Gazette* publishes the text of a bill to enable the municipal commissioners to borrow $8,145,410 for the construction of waterworks to be divided as follows: $600,000 for the extension of filters, $3,834,460 for Kalang reservoir and land and $3,660,950 for Selitar works.

New Wellington Graving Dock.—*The Australasian Hardware and Machinery* announces that John McLean and Co. have been awarded the contract for the construction of the Wellington graving dock, New Zealand, and work will commence at once. The contract price is £196,261 and the time allowed for the completion of the contract is four years.

New Wharves at Kowloon.—The contract for the construction of extensive godowns and wharves at Blackhead Point, Kowloon, for Messrs. Holt and Co. has been awarded Messrs. Howarth, Erskine and Co. Besides the godowns the constructions will consist of a long pier slanting out into the harbor of a length sufficient to accommodate the largest of the Blue Funnel steamers and two smaller piers for ordinary craft.

Fusan Water Works.—A telegram from Fusan says that the sum of 1,520,000 yen, needed for the construction of water-works at Fusan, was voted on April 4 by the Japanese Residents' Association there. The contract will be given to the Water Works Department of the Korean Government and work will be started shortly. Of the above amount, the sum of 350,000 yen will be disbursed by the Korean Government as a subsidy.—*Japan Advertiser.*

Brisbane Water Supply.—The expert employed by the city of Brisbane to make a report on the contemplated increase of the city's water supply recommends a system with a capacity to supply daily 10,000,000 gallons and estimates the cost at about £552,000. The *Australasian Hardware and Machinery* gives the principal items of this estimate as follows:—£37,000 for a dam across the Brisbane River, £132,000 for a pumping station, with the requisite machinery in connection with the forementioned dam, and £67,000 for another line of 42-in. steel pipes taking the place of the present 24-in. line from Mt. Crosby. Taking the first instalment whose immediate carrying out is recommended, "the annual payment will amount to £13,100, making the total cost for operating expenses and capital charges £24,040 per annum, including the present cost of operating the Mt. Cosby pumping station." The expert is an American engineer named Allen Hazen.

SHIPBUILDING AND GENERAL MARINE, FISHERIES, ETC.

Shimonoseki Dock Co.—A number of Japanese merchants at Shimonoseki contemplate the formation of a dock company, there with a capital of yen 350,000.

Moji Dry Dock Co.—A foreign syndicate has agreed to furnish five million yen or half the capital required to float the proposed company. As soon as the legal formalities are concluded work will be commenced.

South Manchuria Deep Fishing.—The Chinese Deep Fishing Co. of Kaiping has granted a concession to a Japanese company for fishing rights along the coast of Southern Manchuria on a royalty of Tls. 5,000 annually.

Big Buoy at Kobe.—One buoy capable of accommodating vessels of 20,000 tons has been placed in position, off Onohama, Kobe. In addition to this the harbor authorities there propose to place five more buoys capable of holding vessels of over 10,000 tons.

Dredger for Penang.—The huge dredge *Crab*, which will be used for dredging and deepening the Penang harbor, arrived recently at Penang. The capacity of this dredge is 350 tons an hour. It was constructed in Renfrew and left that port for Penang on February 2.

Japanese Steamer Launched.—The Hosan Maru, 2500 tons, and a speed test of 13½ was launched from Kawasaka dock yards for the Osaka Shosen Kaisha, April 12. This is the first of two steel spar deck steamers ordered by the company. The other is now being constructed.

Wireless Station at Chosi, Japan.—Pacific steamers will soon have the benefit of a wireless station at Chosi in the Chiba prefecture near Yokohama. It is understood that it will be completed in a few weeks. All Japanese liners are expected to be equipped with wireless apparatus at an early date.

Sungari Steamship Co.—The Sungari Steamship Company, engaged in navigation between Harbin and Chulan-chen on the Sungari under the promotion of some influential merchants in Kirin, has decided to increase its capital, to increase its steamers and extend the line as far as Kirin, Pedne, Tsitsihar and Sanhsing.

The Nisshin Steamship Company.—The amalgamation of the Yangtze river services of the Nippon Yusen Kaisha, the Osaka Shosen Kaisha and the Daito and Hunan Steamship Companies, in order to establish a company under the style of the Nisshin Steamship Company has been consummated and an inaugurated general meeting of the Company was held at the offices of the Nippon Yusen Kaisha on March 25.

Foochow Dockyard.—Peking is considering a proposal to transfer the government dockyards at Foochow to a private company under the stipulation that all warships built in the yard and all ammunition made in the arsenal be furnished only to the imperial government. In view of the fact that the dockyards have been a failure under official management it is believed that the transfer will be approved at Peking.

Osaka Shosen Kaisha.—A contract has been signed between the Osaka Shosen Kaisha and the Kawasaki Dockyard and Mitsubishi Shipbuilding Yard for the construction of six steamers. The steamers are to be used by the O. S. K. for its new American service, and each of them will be of 6,000 tons with a speed of 14 knots. The cost of construction will be 1,100,000 *yen* per boat and all will be completed in three years.

Amur Fishing Rights.—The inhabitants of the city of Nikolaevsk at the mouth of the Amur river, have petitioned the Russian Government that, in case liberty to fish at the mouth of the Amur river is granted to the Japanese, it should be on condition that the Japanese be subjected to the Russian local fishing regulations and that the Japanese employ Russian labor. They declare that unless such stipulations are enforced Nikolaevsk will be completely ruined commercially.

Japanese Whaling Industry.—There are 27 Japanese companies engaged in the whaling industry but the reports for the last year of a few of these companies are not encouraging. The Asahi Fishing Co. had bad luck and lost its fishing fleet through inability to meet its obligations, and other newly launched companies are lacking in enthusiasm. The old companies, however, have managed to announce fair dividends and there is prospect of a better season this year.

Liao River Sailing Ship Co.—The Japanese have inaugurated in Newchang what they style the Liao River Sailing-ship Company," the vessels of which are intended to carry cargo between points on the Liao River, one of the termini being the port of Newchwang. A joint syndicate of Chinese and Japanese has agreed to construct a tramway at Mukden. The trams are first to be dragged by horses instead of being propelled by electricity. Probably this last will follow in due order of time.—*North China Daily News.*

Russo-Chinese Steamship Commercial Co.—It is reported by the Japanese Commercial Agent at Vladivostok that some leading Russian business men are contemplating establishing a shipping association under the appellation of the Russo-Chinese Steamship Commercial Co. The service will be opened between Vladivostok, and India via Saghalien, Nikolaevsk, the China coast and Indo-China. The firm intends to extend the route to European Russia in the future when the number of steamers have been increased.

Yangtsze Steamship Co.—The establishment meeting of the new Yangtsze S. S. Company, formed by the amalgamation of the principal Japanese services, was held at the head Office of the N. Y. K. at Tokio on March 25. The Company's plans, as set forth in the prospectus, were approved, and the following appointments of officials were made:—Managing Director, Mr. Shiraiwa; Directors, Baron Shibusawa, and Messrs. Kondo Rempei, Tosa Kotaro, Takeuchi Naoya, and Nakahashi Tokugoro. It is said that Mr. Ishimoto Kuninosuke, Chief Secretary of the Department of Communications, will be appointed President of the Company.

MINING, MINERALS AND THE METAL TRADE

Japanese Oil Company.—A telegram from Takata under date of March 24 says that a scheme to establish a new kerosene oil company of 1,000,000 yen capital has been promoted there.

Japan Salt Co.—A salt trust has been organized in the prefecture of Kagawa with a capital of Yen 1,000,000. Branch offices will be established in all the principal cities of the empire.

Japanese Bronze Ware.—Bronze ware manufac turers in Takaoka, Japan, which district is noted fo bronze work, have agreed to form a company with a capital of $500,000 for the manufacture of their ware.

Coal-Mining in Afghanistan.—The Amir of Afghanistan has requested Dr. Walter Saise, of Giridih, East Indian Railway, to procure him coal-mining engineers to open out coal mines in Afghanistan and to instruct Afghans in coal-mining.

Royal Dutch Lankat Petroleum Co.—The capital of the Royal Lankat Dutch Petroleum Company, says a Hague telegram dated March 12, has been increased by 50 millions of guilders. Ten millions of the amount will go towards buying up the Shell Company's holdings in Borneo.

Hinode Colliery, Firebrick and Salt Manufacturing Co.—The promoters of this company are Count Yoshii, K. Oishi and M. Yokoyama and the capital stock has been fixed at Yen 5,000,000. The purpose of the company is to engage in coal mining, the manufacture of firebrick and salt.

Tea Trade in Ili Province.—The military governor of Ili province has announced that he will establish a large tea firm in that province for the purpose of supplying the large tea trade of Mongolia and Ili now in the hands of the Russian merchants. This firm will handle Chinese tea exclusively.

Glass Factory for Shangtung.—A glass factory has been started at Poshan, Shantung. The capital is estimated at 1,000,000 taels and the Government of Shantung, through H. E. Yang, is interested for 100,000. The technical leader and all experts are German. The factory will produce window, mirror, and other kinds of glass-ware.

Oppose Standard Oil.—The Standard Oil Company are desirous of getting permission to erect oil-tanks near Wuhu, but the native authorities oppose the idea strenuously, and the Wai-Wu-pu has therefore been requested by the American Minister in Peking to send instructions to the local officials to let the work proceed without hindrance.

Korea Gold Mining.—It has been announced at Seoul that the Kolnische Zeitung, a German firm of Chemulpo, has secured important mining concessions north of Pinyang from the Korean government, with the consent of Tokio. The property will be prospected next month. It is understood that several foreign companies were competing for the concession.

Coal in South China.—There has been a good deal of prospecting off and on in view of the possibility of finding good coalfields in the Two Kwang. Some likely ones have been discovered in Kwangsi, and a company has been formed for some time with a capital of a hundred thousand taels. The plant has been laid, and apparently coal will soon be ready for the market.

Gold in the Netherlands.—Gold is found at many places in Netherlands India. Celebes and Acheen are reported to be rich in gold. European mining enterprise is pioneering in West Borneo. In West Sumatra, Redjang Lebong and Ketahun are the leading gold mines. In North Celebes, the mines that have come prominently into notice are Totok, Paleleh, and Sumelatu.

Japanese Cement Trust.—The Tokio Cement Company is the name of the trust recently organized in Japan with a capital of yen 7,000,000 and which has absorbed the principal cement companies in Nippon. The present amalgamation includes the Saga Cement Co., the Kuyushu Cement Co., the Okayawa Cement Co., the newly organized Manshu Cement Co, and the Tohoku Cement Co.

Electrolytic Refining and Smelting Co. of Australia (Ltd.).—This company has been formed in New South Wales and all the different governments of the commonwealth are concerned in securing the extensive works. The purpose of the company is to engage in the treating and smelting of ores and mattes containing copper, silver and gold and to refine electrolytically blister copper produced in Australia.

Muroran Steel Foundry.—The Hokkaidol Colliery and Steamship Co., the Armstrong Co., and the Vickers Co. of England are considering a proposition to establish a big steel foundry a Muroran. These companies propose to subscribe equal shares in a concern capitalized at ten million yen. The representatives of the English companies have been in Japan in consultation with the management of the Japanese company.

Japan's Salt Industry.—According to the latest investigations made by the Department of Agriculture and Commerce, salt manufacturers—not including their employees—throughout the Empire number 29,895. There are 15,836 salt manufacturing fields which cover 8,367 *cho* (1 *cho* about 2.5 acres). The estimate of salt to be manufactured in the present year is 1,385,747,410i *kin*. The production shows an increase of 39,000,000 *kin* over that of the previous year.

Copper in Turkestan.—According to advices from St. Petersburg to the London *Times*, a syndicate has been formed there for the exploitation of the rich copper mines in Russian Turkestan. The syndicate has acquired rights over 15,000 acres of territory. The district is said to comprise the finest copper-producing area in the whole of the Russian Empire. The company will shortly be formed with an initial share capital of 1,500,000 roubles ($750,000).

Indian Oil Field.—The Burma Government has granted a prospecting license for petroleum over an area of 10 square miles, near the Chaungyin village of the Kalenea township of Kaleungoin, the Upper Chindwin district, a tract of country which has not hitherto been explored.

The authorities are also granting licenses to prospect for oil over certain "blocks" of the Singu (Yenangyaung) oil field in the Myinpyan district, a comparatively new field.

Indian Coal Exports.—The Coal Export figures for the two months ending 28th February, 1907, were tons 391,319 against 407,898 tons same time last year. Bombay has taken tons 147,231 against 147,327 tons for the corresponding time last year. To Penang and Singapore the figures were tons 19,555 against 41,176 tons last period. To Ceylon, Madras, Karachi and Burma, the figures for current and previous periods were respectively tons (26,224—59,588), (48,851—21,100), (44,319—40,401) and (63,168—42,779).—*Capital.*

Japanese Petroleum Industry.—The Hoden Petroleum Co. at Takata has launched a scheme whereby it will control and operate all the oil fields in the Niigata prefecture, Hokkaido, Totomi province, and Formosa. This means an increase in the capital stock of the company of yen 1,000,000. The demand for oil for fuel and illuminating purposes has been increasing yearly and two-thirds of the product used have been imported from foreign countries. The purpose of the Hoden Co. is to develop all the oil fields and meet the entire domestic demand.

Substitute for Cement.—It is reported in Japan that *kazon bai* (volcanic ashes) can be employed as a substitute for builders' cement. Large quantities have been found in the district of Yobiko, near Karatsu, says the *Nagasaki Press*, and a brisk demand for it has been created by the great increase in the price of cement. Hitherto the business has been conducted on a very small scale but a company will shortly be formed with a capital of one million yen to develop the industry. Dr. Hiraga, of Osaka, recently inspected the district and he reports that the prospects of the company are distinctly good.

Tungkuanshan Copper Mine.—The Chinese of the district of Tunglin who are interested in the development of the Tungkuanshan Copper mine have rejected the proposal of the London and China Syndicate comprised of British and Chinese capitalists to work the mine with local capital. The local capitalists claim that the concessionaire, Sir John Keye, had agreed to commence boring and otherwise prospect the belt within a specified time and that this period had expired without the agreement being fulfilled. For this reason the local Chinese ask that the agreement be cancelled. Sir John Gordon, representing the syndicate, protests against the cancellation and claims that work was commenced within the time stated in the original agreement. It is understood that the syndicate is willing to allow the natives 40% of the stock for an extension of its development rights in that section.

Japanese Mineral Output.—Consul-General H. B. Miller sends from Yokohama the following in reference to the output of the principal mineral products in Japan during last year:

The Chugai Shogyo Shimpo states that the mining output generally showed more or less increase, with a

tendency of still further increase in the future. The production of coal amounted to about 13,000,000 tons, an increase of 1,500,000 tons; the output of petroleum to 1,510,000 koku (koku, 40 gallons), an increase of about 200,000 koku; the gold propduced up to the end of November was 720 kwamme, equal to about 5,976 pounds; silver, 19,000 kwamme, or about 157,700 pounds, both showing a slighter decrease. The output of iron ore was 17,000,000 kwamme, or 141,100,000 pounds, an increase of about 6,000,000 kwamme, and of sulphur 50,000,000 kin (kin, 1⅓ pounds), also showing some increase.

The exports of refined copper from Japan during 1906 up to November were valued at $10,729,000, as against exports of $8,000,000 and $6,380,000 during the same periods of 1905 and 1904. Japanese imports of tube copper, however, also show increases, those for the first ten months of 1906 amounting to $357,500, as against $285,000 and $142,000 in the same periods of 1905 and 1904.

FINANCIAL AND MISCELLANEOUS

JAPAN-KOREA SUGAR MANUFACTURING CO.—This ew company, organized with a capital of Yen 8,000,000 will begin operations as soon as 25% of the capital tock is subscribed.

SUGAR AMALGAMATION.—The Taiwan and Daito Sugar Refining Companies held extraordinary general meetings of shareholders April 12 to consider the amalgamation of the two concerns.

CHINESE COTTON MILLS AND CEMENT WORKS.—Viceroy Yuan Shih-kai is proposing to raise a foreign loan of Tls. 5,000,000 for the establishment of cotton mills and cement works on a large scale.

CANADIAN FLOUR.—The Pacific Coast Mills will be unable to fill further orders from the Orient for flour, according to latest advices even at an advance. As a result the demand will be filled by Manitoba flour.

JAPANESE SUGAR TRUST.—The proposed incorporation of the Daito Seito Kaisha (Great Eastern Sugar Manufacturing Company) with the Taiwan Seito Kaisha (Formosan Sugar Manufacturing Co.) was formally settled March 20.

KYOTO AUTOMOBILE CO.—The Kyoto Automobile Company has been organized with a capital of $1,500,000 to operate a public motor service. One hundred vehicles will be first put on the streets, and will maintain a 10-minute service.

TIENTSIN FIRE INSURANCE CO.—The business men of Tientsin have organized a fire insurance company and will operate in Peking, Tientsin and Paoting. It is the purpose of the company to offer protection at a lower rate than now prevails.

BIG JAPANESE BANK.—The scheme to establish a bank with 10,000,000 yen capital, promoted by a number of financiers of Tokio and other places, has matured. The principal promoters of the bank are Messrs. K. Hamaguchi, S. Ohashi and R. Kondo.

AUSTRALIAN TARIFF ON ADVERTISING MATTER.—Many tons of American catalogues and other advertising matter are destroyed yearly by the custom house authorities for the reason that the business men to whom they are addressed refuse to pay the duty chargeable against it.

YOKOHAMA LIFE INSURANCE CO.—The Yokohama Life Insurance Company, organized by Messrs. Ono, Hiranuma, Hara, Mogi, Asada, Otani, Watanabe, Kimura, Higuchi, Ishikawa with a capital of 1,000,000 *yen* was permitted to start business under date of March 7.

BURMA RICE CROPS.—The final official report on the Burma rice crop of the year 1906-07 just published estimates the total area of the crop at 6,974,751 acres as against last year's area of 6,713,382 acres, and the yield in cleared rice at 61,924,000 cwts. as against 57,940,000 cwts.

KOREAN WAREHOUSE CO.—The inaugural general meeting of the shareholders of the Kankoku Soko Kaisha (Korean Warehouse Company) was held at the Tokio Bankers' Club on March 25. The Company will undertake the business of warehousing and transportation in Korea.

NEW KOBE COMPANY.—A new Kobe company named the Toyo Boyeki Kaisha, is being promoted by Messrs. Nishio, Yamamoto, Kuratani, Tanaka Tsutsuma, W. H. Gill and others. The capital is one million yen. The new company will take over the business of the Nishio Shokai, general merchants, in Sakayemachi.

WORLD RUBBER TRUST.—A cablegram from New York announces the formation of a trust by the large American Rubber interests having for its object the control of all the rubber holdings in Java, Sumatra and the middle east. The remarkable development of the rubber industry in the far east is responsible for this movement.

KUANG RUBBER CO.—The Kuang (Selangor) Rubber Company has been registered at London with a capital of £20,000 in £1 shares. To adopt an agreement with W. de Leighton Brooke for the purchase of 1,000 acres of land, near the forest reserve on the Kuang Penghalan Kundang road in the district of Ulu Selangor, State of Selangor. No initial public issue.

JAPANESE BANKS.—The investigation made by the Japanese Department of Finance show that the number of banks throughout the country at the end of March was 2,237 and the amount of capital 590,488,669 yen. This shows an increase of five in the number of banks and an increase of 23,492,400 yen in the amount of capital as compared with the figures at the end of February.

CEYLON TRADE OPPORTUNITIES.—An American located in Ceylon desires to open correspondence with American manufacturers who wish to export steam plows, carriages, motor cars and flour to that island, and with importers who are prepared to handle Ceylon tea, cinnamon, cardamons, desiccated cocoanuts, coçoanut oil, plumbago, citronella oil and coir rope and fiber.

CABLE AND TELEPHONE FOR BANGKOK.—The Siamese minister of public works has received the sanction of the King to the proposal to acquire and instal an entirely up-to-date telephone system in Bangkok. The system decided on is the one known as the central battery system. The installation will go to public tender. Phya Sukhum is now engaged arranging for a new cable from Koh-Si-Chang to Sirachi with connection to Bangkok.

MANILA AUTOMATIC TELEPHONE CO.—A franchise has been granted President Brown of the Automatic Telephone Co. provisional upon the approval of the municipal board of the city of Manila and all the recognized commercial bodies. The Philippines Telephone and Telegraph Co. now operating a system in the city is making a hard fight in the different chambers to shut the automatic people out.

ISSUE OF PAPER MONEY.—The Peking branch of the National Bank of China has issued Tls. 1,000,000 worth of notes for circulation in the metropolis by sanction of Pu Ting, President of the Ministry of Finance, and according to an official proclamation from the Chinese Authorities the people are ordered to accept these notes without discount so as to assist the Government Bank, which is the only one of its kind in China.

KIRIN BREWERY SOLD.—The Kirin Brewery has been sold for $1,000,000 gold to a Japanese company, states the *Deutsche Japan Post*. The Kirin Brewery dates from 1886, when it was registered in Hongkong as a British firm. The master brewers have always been Germans. The new company has been formed by the partner of the firm, Heidiya G. Yonei. This firm has for many years held the general agency for the whole of Japan.

JAPANESE BANK IN SIBERIA.—The *Amurski Vestnik* announces that the Japanese intend to assist the development of their commercial dealings with the Russian merchants in the Far East by opening a branch of the Japanese bank "Dsju Hatschi Tchinko" at an early date. This branch was to have been opened at Vladivostok last August, but the negotiations fell through for the time. This will be the first branch of a Japanese bank to be opened in Siberia.

EAST ASIATIC INDUSTRIAL SYNDICATE.—According to Tokio papers, the East Asiatic Industrial Syndicate, organized by French and Belgian capitalists in December last, have established their Tokio office at Uchisaiwai-cho to invest capital in all favorable enterprises in Japan in conjunction with native capitalists. The syndicate contemplate the establishment of engine works in the vicinity of Osaka with the aid of the Minister of Agriculture and Commerce.

TANDJONG RUBBER CO.—The Tandjong Rubber Company has been registered at London with a capital of £100,000 in £1 shares. To acquire from Harrison and Crossfield, of 3, Great Tower-street, E. C., an option for the purchase from the Algemeene Consignati Bank of Amsterdam of the lease or land concession of the Tandjong Kassau Estate, in the regency of the East Coast of Sumatra, consisting of about 4,782 bouws, or 8,460 acres, and to carry on the business of growers of rubber and other produce, etc.

DEUTSCH-ASIATISCHE BANK.—This institution is one of the most important German enterprises in the far east and to its many branches is due the remarkable expansion of German trade in Eastern Asia. The Deutsch-Asiatische Bank is carrying on business in Eastern Asia. Its principal establishment is in Shanghai and it possesses branches in Calcutta, Hankow, Hongkong, Peking, Tientsin, Tsingtau, Tsinanfu, Yokohama and Kobe. It also coöperated in introducing to the international market a Japanese loan and the first financial operation of Siam.

THE MANILA HOTEL.—Messrs. Lack and Davis have made a proposition to the Philippines commission in which they offer to exchange land for an hotel site on the new Luneta Extension and they also agree to build an hotel costing at least 400,000 pesos as one of the conditions of the exchange. The firm ask that in case the proposition is accepted the property acquired from the government be exempted from taxation for the period of construction and for ten years thereafter The matter will soon be considered by the commission.

JAPANESE COTTON MILLS.—There are at present 46 cotton mills in this country. The number of men and women employed is estimated at 15,270 and 66,350 respectively and the average wages of these employes is 38 *sen* for men and 23 *sen* for women a day. A comparison with the corresponding period of last year shows an increase of 700 men workers and 3,280 women workers, while the wages have risen by one sen per man and two *sen* per woman. Along with the ever growing skill of the men, the increase of cotton gins and the improved condition of machinery, the productive power of these mills is daily increasing.

THE YALU TIMBER INDUSTRY.—According to the terms of a former treaty between China and Japan it was arranged that a company should be formed, with Chinese and Japanese capital, for the purpose of cutting lumber along the Yalu and exporting it to whatever places where a market could be found for it. As a kind of supplement to that understanding a new agreement has lately been concluded between the Wai Wu-pu and the Japanese Minister by which the area in which the Company is to operate shall be extended to the Kwuntung River, and the duration of the concession to 99 years.—*Japan Advertiser*.

LIFE INSURANCE IN JAPAN.—According to Japanese papers life insurance business in Japan has shown a steady improvement since the war. New policies issued by the Meiji Life office during the first half of last year represented -Y-3,900,000; those of the Nippon Life -Y-3,700,000; those of the Daido Life -Y-3,400,000, roughly, -Y-36,000,000 including all others. The amount for the second half of the Meiji reached -Y-5,700,000, totalling to -Y-6,000,000 and Daido -Y-5,000,000, totalling to -Y-48,000,000 including all others. When these two totals are added to the amount contracted previously, the grand total reaches the sum of -Y-324,000,000.

PENANG SYNDICATE.—The Penang Syndicate has been issued with a capital of £60,000 (600 £100 ordinary and 200 1s. deferred). To acquire certain estates, plantations, and lands in the Province Wellesley, Straits Settlements, to adopt an agreement with L. Huttenbach, and to carry on the business of tea, coffee, sugar, tapioca, pepper, sago, india rubber, cocoanut, tobacco, and general produce growers, etc. No initial public issue. Articles authorize directors to issue 450 ordinary shares; remaining 150 not to be issued without consent of the holders of two-thirds of ordinary shares previously issued. First directors (not less than three nor more than five) not named. Qualification, five ordinary shares. Remuneration according to profits.

PINE-APPLE TRUST.—According to the *Straits Times* an attempt is being made to corner the pineapple industry in the Straits Settlements and that paper believes that such a movement would have the effect of reducing the demand both locally and in Europe on account of the unnatural advance in prices.

There are now fifteen independent pine apple factories in operation in Singapore alone and the fruit exported each year amounts to 550,000 cases, valued at approximately $3,000,000. The United Kingdom takes about 295,000 cases, of the value of $1,500,000, the United States 60,000 cases valued at $300,000, and Sweden, Tringganu, Turkey in Asia, Turkey in Europe, and a number of British possessions the remainder.

SINGAPORE RUBBER WORKS.—The Singapore Rubber Works, whose works are at Pasir Panjang, have decided to go in for a more extensive manufacture of rubber tyres. They have been turning out various articles in vulcanised rubber, for which there are obvious facilities here, in the way of cheap and pure rubber, cheap labor, and the saving of freight on the raw material and the manufactured article. We have seen two samples of the stock tyre products of the factory, and excellent vulcanised rubber they seem, with none of the grittiness and shortness of fibre—rather lack of tenacity—which characterizes the cheaper vulcanized article from Home. Come to think of it, there is an appropriateness in driving about in a rubber tyred vehicle in the Gardens where the rubber itself grew, the native article that has never been across the sea.—*Free Press.*

SOUTH AUSTRALIA'S HARVEST.—The *Observer* estimates that the area under wheat for grain in South Australia this season to be 1,820,000 acres from an average yield of 11¼ bushels per are, making a gross outturn of 20,475,000 bushels. This, if realized, will make the "banner" crop of the State, the harvest of 1905-6, according to the official figures, having been 20,143,798 bushels from 1,757,036 acres—an average of 11.46 bushels per acre. The weather this season has been more favorable than last year, so the sanguine estimate may be realized. It is over 1,000,000 bushels less than the estimate published in our December issue, made by the contemporary journal in Adelaide. It is calculated that there will be a surplus of 455,000 tons. In regard to wheat for hay both journals put it at 300,000 acres against 317,922 acres in 1905-6.

JAPANESE TEA FIRING TRUST.—Five Japanese tea firing companies, the Toyo, Ogasa, Mukinohara, Fujieda, and Kyoyekisha, have lately been purchased by a big Japanese tea refiring company organized by Mr. Rempei Kondo, President of the Nippon Yusen Kaisha, and capitalists in Tokio and Shizuoka prefecture, under the style of the Nippon Kiodo Seicha Kaisha. The capital of the concern is yen 1,000,000 and the face value of the shares yen 50. It is said that the company will have its own refiring plants running from the coming tea season. This company will receive an allowance of yen 20,000 annually from the Shizuoka Tea Traders' Association in Shizuoka for three years. Besides this unusual advantage, the Nippon Yusen Kaisha will do all in its power to further the prosperity of the new company in return for preferential treatment by the latter in the matter of freight, consisting of tea, which will be given almost entirely to the N. Y. K.

SHANGHAI-PAOSHAN LAND CO.—The prospectus of the Shanghai-Paoshan Land Co. with an authorized capital of Tls. 1,000,000 has been issued and a large part of the stock subscribed. The purpose of the company is to purchase and develop 70 mow of land in the Paoshan district situated on the north of the international settlement at Shanghai. The prospectus describes the plot of land more definitely as follows:—The three estates of which it is composed abut indeed on to the south, west and north boundaries of the park; they will be approached directly by the North Szechuen Road Extension and a bird's eye view of a provisional plan for developments shows area for eigthy-two houses, together with stábling, estimated to produce rentals of from Tls. 60 to Tls. 75 per month according to size and aspect. On the west (the longest) side the railway forms a barrier against any possible encroachment from Chinese houses, while to the south there has already sprung up the populous suburb of over a hundred foreign houses.

TELEPHONE CONNECTIONS FOR SUBURBAN CAR LINES

The rapid extension of the inter-urban electric railway in this country, and particularly in New England and the Middle West, has resulted in the development of a new set of train dispatching problems. One of the most satisfactory means for meeting these is some modified form of telephone.

In speaking on this feature of telephone development before a recent meeting of the Street Railway Club in Boston, C. J. H. Woodbury said:

In the early days of electric railroads when the motor was merely a substitute for the horses on the same cars and even at similar speed, there was not the requirement of any signalling system more than the unfilled need which had already existed in the case of horse cars, but with the expansion of the carrying capacity of a road both as to size of cars and speed of propulsion, and, above all, the long distances of the inter-urban roads, conditions became radically changed and were comparable to those of the steam roads. This development of the transportation facilities became so much more rapid than that of the signalling that the early electric roads were afflicted with a number of mishaps which gave rise to many serious apprehensions as to the advisability of this change of power.

In electric railways the conditions of speed are comparable to those of steam railway trains and the weight of the cars sufficient to cause destructive results in case of collision, while the requirements of good service at these speeds demanded that there should be constant information of the positions of the various cars en route.

The street railways had the advantage of precedent, and in New England the Worcester Street Railway began to use the telephone in 1899, and since its consolidation with other companies these ramifications extend over a large range of territory throughout the heart of the commonweatlh.

The application of the telephone for train dispatching has resulted in a marked economy of both plant and operation in that the ability of the superintendent to be informed as to the position of the various cars and to communicate with their operators gives a greater service efficiency to the road. Single track railways in sparsely settled districts can be operated at an efficiency which should otherwise require a double-track road, merely by the use of the telephone for dispatching, because in case of cars failing to join at meeting points when they are due, they may under this direction avoid delaying the prompt car by directing it to proceed to another turnout. In case of failure to meet at scheduled turnouts there is not the risk of collision by one car running wild to the next switch.

THINGS JAPANESE

By Walter J. Ballard.

Special mail advices from Tokio and Yokohama inform us of the following items regarding Japan:

Japan's wheat crop in 1906 was 20,284,762 koku, the largest crop since 1901 and 1,500,000 koku larger than the crop of 1905. For the last ten years the crop has averaged 19,306,229 koku.

Japan's budget for the next fiscal year (beginning April 1) will include an appropriation for a Fine Arts School.

The Ladies' Patriotic Association of Japan is instructed (equivalent to an order which all obey) by its President, Princess Kau-in, to bear in mind the importance of economy and thriftiness.

It was soon after the Japan-China War in 1894-5 that Philippine students went to Japan to study. Since that time the number of such students in Japan has steadily increased. Up to the present time they number seventy-four in all, distributed as follows:

Imperial Universities	10
Tokio High Technical School	6
Foreign Language School	2
Tokio Morning Star School	1
Tokio-Gakuin	9
Marine Products School	5
Kumanioto High Technical School	6
Yokohama Morning Star School	7

The other twenty-eight are scattered among the Fukuka Technical, Kyoto High Technical, Nagoya Technical, Oji paper mills, Nippon Yusen Kaisha Ship Company, Honis Iwamote glass factory and the Honjo Kato porcelain factory.

At the meeting in Tokio of the Economic Association of Japan Dr. Sakatani, the Japanese Minister of Finance, strongly urged the policy of "no more taxes and no more flotation of increasing public loans." In that advocacy the Minister is right at least for Japan's next ten years.

To propagate and sell live fishes The Nippon Fish Culture Company has been formed with $750,000 capital.

The Upaga Dockyard Company, hitherto devoted to ship repairs, is now fitted to construct ships of large tonnage. They built some torpedo boats which gave satisfaction during the recent war.

The Tokio Hydro-Electric Power Company is inaugurated. It has 100,000 available horse power. It will supply all the power needed for electric lighting and street railways inTokio and Osaka and between.

The *Hochi* warns Baron Goto, the President of the South Manchurian Railways, to quit talking and boasting until he has accomplished something. So far he has done nothing but talk. It augurs well for Japan's future when her newspapers speak "right out in meeting."

The *Jiji* says that the Chinese Commissioners to Manchuria were treated as foreigners in the Russian sphere but as brothers in the Japanese part. Their reports, thinks the paper, will lend a good deal of influence toward creating favorable feeling in China toward Japan.

The *Nippon* advises Japanese politicians to ease up on politics and go to work earning something (good advice that to American professional politicians), or at least, to interest themselves in earning enterprises. It also urges business men to take more interest in normal politics. In other words politics to help business, not politics as a business.

The *Nichi-Nichi* says that the development of Manchuria is a step toward the preservation of peace in the Far East. The editor is right in that statement.

Princes and personages decorated with the grand order of the junior grades and members of the Japanese Parliament and all of the foreign diplomatic corps were honored by invitations to the Imperial New Year's party at the palace in Tokio.

Italy is getting Japanese seed rice through the hands of the Italian Ambassador to Japan.

The *Hochi* advocates Japanese participation in the coming session of the International Parliamentary Congress.

The municipality of Tokio is improving the streets, dredging the Sumida, constructing the Tokio harbor, creating the Tokio Exposition, municipalizing the street railways, investigating the municipal organization and is in various other enterprises, none of which, says *Jiji*, has made any progress. The editor quotes: "One thing at a time, and that done well, is as good a rule as we can tell."

FAR EASTERN PROGRESS

The general manager of the Laou Kung Mow Cotton Spinning and Weaving Company (Limited), at Shanghai, states that the balance of the credit of profit and loss account for 1906 amounts to 146,555 taels (Shanghai tael, $0.726), subject to audit, out of which the board recommend a payment of a dividend of 8 taels per share, which will absorb 57,264 taels.

It is proposed to form the Canton River Bridge Company (Limited) with an initial capital of $1,000,000. Three bridges across the river shall, it is suggested, be constructed at convenient places, the first near Yau Lan Mun, where the ferry jetty stands. If the fees collected are enough to pay for the inter est on capital, etc., the second and third bridges shall be started in succession.

BRITISH COMMERCIAL ATTACHES

The new system of commercial attaches, which is shortly to be introduced by the British Foreign Office, has been explained in some detail to the London Chamber of Commerce by Lord Fitzmaurice.

The present system is that the commercial attaches resident abroad are responsible for certain areas, which often include several states, with headquarters at a mission. This system has given good results, but it was also found that long and continuous residence abroad makes it difficult for the commercial attache to keep in touch with British commercial and industrial interests and developments. Moreover, much of the work done by them abroad might very properly be left to the members of the diplomatic and consular services. It is now proposed that a member of the mission staff shall, during his appointment at the mission, take charge of the commercial work, receiving special remuneration on this account.

Steps will also be taken to facilitate the discharge of the commercial duties of the consuls by re-enforcing their staff whenever required. The commercial attaches themselves are in future to have their headquarters in London, and will divide their time between special investigations abroad in the interest of British exporters, work in the board of trade or commercial department of the foreign office, and visits to manufacturing districts in the United Kingdom.

It is considered that their work abroad will be more valuable if carried out under the instructions of the foreign office and board of trade, and for particular purposes, than heretofore from foreign missions; and this gain is expected to more than compensate for any additional loss of time and expense in the journey. The position of the commercial attaches in remote countries, such as China, Turkey and other places where special qualifications are necessary, and in Paris, where the presence of the commercial attache is indispensable, will remain unchanged.

The commercial attache will, therefore, become a national commercial traveler, and will be able to devote his whole time to extending his experience of home and foreign conditions; the mere routine portions of his present occupations being left to the specially responsible commercial secretaries in the foreign missions and to the consuls.

The principal changes which are involved by the introduction of the new system are as follows: (1) The posts of commercial agents in Switzerland, United States of America, Russia and Central America will be abolished. (2) The present commercial agent in Russia will be made a commercial attache. (3) The latter and the three commercial attaches now in Vienna, Berlin and Madrid will have their headquarters in London. (4) The current commercial business of the diplomatic missions will be carried on under the superintendence of a specially selected member of the diplomatic staff, who will be designated "secretary in charge of commercial matters," and receive an allowance varying according to the importance of the post.

No change is to be made in the present arrangements at Pekin, Tokio and Constantinople, and Sir H. Austin Lee will remain at Paris as commercial attache. These changes have been sanctioned by the treasury, and the new system will, as far as possible, come into force on April 1. It is not intended that the secretary in charge of commercial matters should undertake special and exhaustive inquiries or that he should devote himself exclusively to commercial work.

The object of the present proposals is to secure systematic and continuous attention to current commercial business on the part of a particular member of the staff. These changes are not intended to diminish the responsibility of the head of the mission for the efficient conduct of this branch of diplomatic duty, or to relieve him from the obligation of carefully following all commercial developments likely to affect the trade of the United Kingdom, and endeavoring in every way to protect and foster British commercial interests.

FAR EASTERN STOCKS AND QUOTATIONS

Courtesy of Messrs. Kadoorie & Co., Hongkong, for May.

STOCK.	WHEN ESTABLISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	WORKING ACCOUNT	DATE	LAST DIVIDEND.	Approximate Yield per cent. per annum at Present Quotation.*	CLOSING QUOTATIONS.
BANKS.											
Hongkong & Shanghai Banking Corporation	1865	$10,000,000	80,000	$125	$125	*g* £1,000,000 *s* $11,000,000 *i* $250,000	$1,721,558	31-12-07	£1.15/- and bonus of £1 @ ex. 2/3¼ $24.33 making $40.80 for 1906	4½	915 sales & s. £104
National Bank of China, Ld.	1891	£699,475	10) 99,925	£7	£6	*c* £12,735 $150,000	$74,099	31-12-05	$2 (London 3/6) for 1903	....	$51
MARINE INSURANCES.											
Canton Insurance Office, Ld.	1881	$2,500,000	10,000	$250	$50	$1,675,000 *j* $200,000	$233,638	31-12-05	$20 for 1905	7	$282 sellers
North China Insurance Co., Ld.	1863	£150,000	10,000	£15	£5	*g* £110,000 *s* Tls. 100,000 *f* Tls. 50,000	Tls. 185,529	30-6-06	Interim of ⅛ for account 1906 at ex. 2-10, 11-16 per tael	6	Tls. 77½ ex div. s.
Union Ins. Society of Canton, Ld.	1867	$3,100,000	12,400	$250	$100	*s* $3,000,000 *g* £70,000 *f* $456,407 *j* £125,137.15 *u* $817,628	$1,460,490	31-12-06	Final of $12 making $42 for 1905, and interim of $30 for account 1906	5½	$770 sellers
Yangtsze Ins. Association, Ld.	1862	$800,000	8,000	$100	$60	$850,000 *j* $136,287 *f* $ 15,527	$461,476	31-12-06	$12 for year ending 31. 12. 05	7½	$158 ex div. b.
FIRE INSURANCES.											
Chine Fire Ins. Co., Ld.	1870	$2,000,000	20,000	$100	$20	$1,000,000 *x* $320,449 *f* $7,616	$362,980	31-12-06	$6 and bonus $2 for 1905	9½	$85 sellers
Hongkong Fire Ins. Co., Ld.	1868	$2,000,000	8,000	$250	$50	$1,256,483	$435,236	31-12-06	$40 for 1905	12	$330 sellers
SHIPPING.											
China & Manila Steamship Co., Ld	1882	$750,000	1) 30,000	$25	$25	$7,000	$365	31-12-06	$1 for 1906	6½	$16 sellers
Douglas Steamship Co., Ld.	1883	$1,000,000	20,000	$50	$50	$264,638 *i* $93,562	Nil.	30-6-06	$2½ for year ended 30-6-06	6¾	$38 sales and b.
Hongkong, Canton & Macao Steamboat Co., Ld.	1865	$1,200,000	80,000	$15	$15	*e* $250,000 *d. i.* $600,000 *f* $144,386	$20,170	31-12-06	$1 for 2nd ½-year making $2.00 for 1906	6¾	$29¾ buyers
Indo-China Steam Navigation Co., Ld.	1882	*n* £600,000	2) 60,000	£10	£10	£120,000 *i* £280,958 *h* £3,999	£2,452	31-12-06	10/- @ ex. 2-1 9-16 = $4.69 for 05.	....	$71 sales
Shanghai Tug & Lighter Co., Ld. Do. Preference	1903	Tls. 1,500,000	20,000 10,000	Tls. 50	Tls. 50	*i* Tls. 40,000	Tls. 3,156	31-12-06	Int. div. of Tls. 2½ % 1906 Int. div. of Tls. 1¾	9 6¾	Tls. 52 sales Tls. 50 buyers
"Shell" Transport & Trading Co., Ld.	1898	£ 2,000,000	2,000,000	£1	£1	£400,000 *i* £5,167.14-1	£85,355-6-10	31-12-05	1/-(Coupon No. 7) for 1906	2½	45/- buyers
"Star" Ferry Co., Ld.	1898 1900	$200,000	10,000 10,000	$10 $10	$10 $5	$65,000 *i* $32,957	$218	30-4-06	$1.50 75 cts. for year ended 30-4-06	5 3¾	$30 sellers $19½ sellers
Taku Tug & Lighter Co., Ld.	....	Tls. 1,500,000	12) 30,000	Tls. 50	Tls. 50	Tls. 98,000 *d* Tls. 419,479 *e* Tls. 62,000 *i* Tls. 81,200 *q* Tls. 30,000	Tls. 18,730	31-12-06	Final of Tls. 2 making Tls. 6 for 1906	11½	T. Tls. 52 buyers
REFINERIES.											
China Sugar Refining Co., Ld.	1878	$2,000,000	20,000	$100	$100	*o* $345,741 *e* $450,000 *r* $ 56,848	$9,218	31-12-06	$8 for year ending 31-12-06	6¾	$118 buyers
Luzon Sugar Refining Co., Ld.	1882	$700,000	7,000	$100	$100	none	*Dr.* $138,523	31-12-06	$3 for 1897	....	$21
Perak Sugar Cultivation Co., Ld.	....	Tls. 350,000	7,000	Tls. 50	Tls. 50	Tls. 100,000	Tls. 8,935	31-8-06	Tls. 4. (8%) for year ending 31-8-06	4¾	Tls. 85 buyers
MINING.											
Chinese Engineering & Mining Co., Ld.	1901	£1,000,000	1,000,000	£1	£1	*d* £110,000 *h* £12,289	£12,546	28-2-06	Final of 1/6 for account year ending 28-2-07	4¾	Tls. 14 b. ex. div
Oriental Consolidated Mining Co., Ld.	1901	G. $5,000,000	*y* 500,000	G. $10	G. $10	none	G. $909,050	30-6-06	Interim of 50 cts. for % 1906	10	G. $10
Raub Australian Gold Mining Co., Ld	1892	£200,000	150,000 50,000	£1 £1	18-10 £1	£4,837	*Dr.* £15,481	31-3-06	No. 12 of 1/- = 48 cents	....	$7 sellers
DOCKS, WHARVES AND GODOWNS.											
Fenwick (Geo.), & Co., Ld.	1889	$450,000	*z* 18,000	$25	$25	$64,124	$10,335	31-12-06	$1¾ for year ending 31-12-06	9¾	$18 sales
Hongkong & Kowloon Wharf & Godown Co., Ld.	1886	$2,000,000	40,000	$50	$50	$550,000 *t* $23,152 *i* $30,000	$3,047	31-12-06	Final of $2½ making $5 for 1906	6	$85
Hongkong & Whampoa Dock Co., Ld.	1866	$2,500,000	50,000	$50	$50	*v* $50,000 $49,000	$400,933	31-12-06	$6 for 2nd ½-year making $12 for 1906	10½	$115 sellers
New Amoy Dock Co., Ld.	1892	$67,500	10,000	$6¾	$6¾	$88,000	$2,618	31-12-06	50 cts. for 1906	4½	$11½
Shanghai Dock & Engin'g Co., Ld.	1906	Tls. 5,570,000	13) 55,700	Tls. 100	Tls. 100	Tls. 1,000,000	Tls. 3,997	30-4-06	Final of Tls. 4 making Tls. 8 for 05-'6	9½	Tls. 85 buyers
Shanghai & Hongkew Wharf Co., Ld.	1902	Tls. 3,600,000	14) 36,000	Tls. 100	Tls. 100	*b* Tls. 487,210 *r* Tls. 100,000 *p* Tls. 190,100 *e* Tls. 75,000	Tls. 23,117	31-12-06	Final of Tls. 10 making Tls. 18 for year ending 31-12-06 (on old capital)	8½	Tls. 217½ sales
Vulcan Ironworks, Ld.	1905	Tls. 500,000	1,000	Tls. 500	Tls. 500	......	Tls. 12,187	31-8-06	Tls. 50 for year ended 31-8-06	10	Tls. 500 sellers
Yangtsze Wharf & Godown Co., Ld.	1902	Tls. 250,000	2,500	Tls. 100	Tls. 100	Tls. 50,000	Tls. 12,936	31-12-05	Tls. 18 for 1905	7¾	Tls. 230
LANDS, HOTELS AND BUILDINGS											
Anglo-French Land Investment Co., Ld.	1906	Tls. 2,500,000	3) 25,000	Tls. 100	Tls. 100	Tls. 15,000	Tls. 3,388	28-2-07	Tls. 6 for 14½ months ending 28-2-07	6	Tls. 100 buyers
Astor House Hotel Co., Ld.	1901	$750,000	4) 30,000	$25	$25	$30,000	$8,418	30-6-06	$3 for year ending 30-6-06	10	$30 sellers
Astor House Hotel, Ld. (Tientsin)	....	Tls. 100,000	2,000	Tls. 50	Tls. 50	Tls. 35,000 *e* Tls. 10,000	Tls. 1,013	28-2-06	Final of Tls. 6½ making Tls. 11½ for year ending 28-2-06.	8½	Tls. 140 buyers
Central Stores, Ld. Do. (Founders') Do. (New Issue)	 1904	$451,845	6,000 123 24,000	$15 $15 $15	$15 $12 $15	*n.* $1,000	$9,178	31-12-06	$1.80 for 1906 None. 7% 1906	10	$18 buyers $300 buyers $14¾
Hongkong Hotel Co., Ld.	1866	$600,000	12 000	$50	$50	$648,975 *r* $26,075	$371	31-12-06	$5 for 2nd half-year making $10 for 1906	8½	$118
Hongkong Land Investment & Agency Co., Ld.	1889	$5,000,000	50,000	$100	$100	*e* $250,000	$56,218	31-12-06	Final div. of $3½ making $7 for 1906	6½	$107½ sellers
Hotel des Colonies Co., Ld.	1902	Tls. 225,000	9,000	Tls. 25	Tls. 25	*h* Tls. 29,783	Tls. 1,935	31-3-06	Final of 6% = making 10% for 1905	16¾	Tls. 15½
Hotel Metropole Co., Ld.	1904	$200,000	2,000	$100	$100	none	$4,699	30-6-05	Final of $6 making $10 for the year	12½	$80
Humphrey's Estate & Finance Co., Ld.	1887	$1,500,000	150,000	$10	$10	*i* $208,386 *e* $50,000	$11,567	31-12-06	80 cents for 1906	7½	$11 sales

FAR EASTERN STOCKS AND QUOTATIONS—(Continued.)

STOCKS	WHEN ESTABLISHED	CAPITAL	NO. OF SHARES	VALUE	PAID UP	RESERVE	WORKING ACCOUNT	DATE	LAST DIVIDEND	Approximate Yield per cent. per annum at Present Quotation.*	CLOSING QUOTATIONS
Kowloon Land & Bldg. Co., Ld.	1889	$300,000	6,000	$50	$30	none	$1089	31-12-06	$2½ for 1906	6½	$37½
Shanghai Land Investment Co., Ld.	1888	Tls. 3 900,000	52,000	Tls. 50	Tls. 50	Tls 869,493	Tls. 61,978	31-12-06	Final div. of Tls. 3 and bonus of Tls. 1½ (old shares) and div. of 75 cents and bonus of 19 cts. (new shares) for 1906	7½	Tls. 103 buyers
Do. New Issue	1906		26 000	Tls. 50	Tls. 50	*e* Tls. 170,000					Tls. 101
Tientsin Land Investment Co., Ld.	1902	Tls. 772,600	7,726	Tls. 100	Tls. 100	*i* Tls. 71,685	Tls. 1,973	31-12-06	Final of Tls. 5 making Tls. 8 for 1906	8	Tls. 100 buyers
West Point Bldg. Co., Ld.	1889	$625,000	12,500	$50	$50	none	$1,519	31-12-06	Final div. of $2.10 making $4.10 for 1906	8½	$49 sellers
COTTON MILLS.											
EwoCotton Spinning & Weaving Co., Ld.	1895	Tls. 1,000,000	5) 20,000	Tls. 50	Tls. 50	Tls. 150,000 Tls. 45,939	Tls. 64,986	31-10-06	Tls. 10 for year ended 31-10-06	16½	Tls. 62 buyers
Hongkong Cotton Spinning, Weaving & Dyeing Co., Ld.	1901	$1,250,000	125,000	$10	$10	*e* $110,000	$21,660	31-7-06	$1½ for year ended 31-7-06	11	$11½
International Cotton Manufacturing Co., Ld.	1895	Tls. 750,000	6) 10,000	Tls. 75	Tls. 75	Tls. 150,000	Tls. 36,211	30-9-06	Tls. 6 for year end. 30-9-06 (8%)	9½	Tls. 65 sellers
Laou-kung-mow Cotton Spinning & Weaving Co., Ld.	1895	Tls. 800,000	7) 8,000	Tls. 100	Tls. 100	none	Tls. 31,469	31-12-06	Tls. 8 for 1906	9¾	Tls. 82½
Soy Chee Cotton Spinning Co., Ld.	1895	Tls. 1,000,000	2,000	Tls. 500	Tls. 500	*l* Tls. 28,257	Tls. 50,663	31-12-06	Tls. 50 for 1906	13½	Tls. 370
MISCELLANEOUS.											
Anglo German Brewing Co., Ld.	1904	$100,000	4,000	$100	$100	none	$906	31-12-06	$7 for 1906	8¾	$80
Bell's Asbestos Eastern Agency, Ld.	1895	£5,377.10s	11) 8,604	12-6	12-6	£814	£856	31-12-05	1s. 3d. for 1905	8½	$7 sellers
Campbell, Moore & Co., Ld.	1886	$12,000	1,200	$10	$10	$9,000	$653	31-12-06	$3 for 1905	....	$20 sellers
China-Borneo Co., Ld.	1903	$720,000	8) 60,000	$12	$12	none	Nil.	31-12-06	$1 for 1904	....	$9½
China Flour Mill Co., Ld.	....	Tls. 200,000	4,000	Tls. 50	Tls. 50	Tls. 50,000	Tls. 889	31-12-05	Final of Tls. 5 making Tls. 10 for 1905	16½	Tls. 60 buyers
China Light & Power Co., Ld.	1901	$500,000	50,000	$10	$10	none	$25,000	28-2-07	60 cents for year ending 28-2-06	....	$7 sales
China Provident Loan & Mortgage Co., Ld.	1898	*a* $1,000,000	100,000	$10	$10	$115,000	$855	31-12-06	80 cents for 1906	9	$9 sales
Dairy Farm Co., Ld.	1896	$187,500	25,000	$7½	$6	$50,000	$2,555	31-7-06	$1.30 for year ending 31-7-06	8½	$15½ buyers
Green Island Cement Co., Ld.	1889	$2,000,000	200,000	$10	$10	$411,000 *p* $500,000	$10,804	31-12-06	Final of $1½ making $2 for year ending 31-12-06	10½	$19 sellers
Hall & Holtz, Ld.	....	$420,000	21,000	$20	$20	$186,000	$20,893	28-2-06	$2½ for year ending 28-2-06	10½	$23 buyers
Hongkong Electric Co., Ld.	1889	$600,000	60,000	$10	$10	none	$2,568	28-2-06	$1.00 / 65 cts. for 10 months ending 28-2-06	7¾	$16 buyers
Peak Tramways Co., Ld.	1907	$750,000	15) 75,000	$10	$10	none	none	....	First year	....	$12 sales
Hongkong Ice Co., Ld.	1881	$125,000	5,000	$25	$25	*k* $105,000	$4,361	31-12-06	Final of $18 making $22 for the year ending 31-12-06	9½	$240
Hongkong Rope Manufacturing Co., Ld.	1883	$500,000	50,000	$10	$10	$65,000	$4,212	31-12-06	$2 for year ending 31-12-06	10	$20 buyers
Hongkong Steam Waterboat Co., Ld.	1900	$150,000	15,000	$10	$10	$2,500	$88	30-9-06	Final of 50 cents making $1 for year ended 30-9-05	....	$9½ sales & b.
Maatschappij tot Mijn-, Bosch- en Landbouwexploitatie in Langkat	1902	Gs. 2,500,000	25,000	Glds. 100	Glds. 100	Tls. 547,500 *i* Tls. 27,603	Tls. 10,374	31-10-05	First interim div. of Tls. 7½	10¾	Tls. 280 buyers
Mondon (E. L.), Ld.	1902	Tls. 350,000	7,000	Tls. 50	Tls. 50	none	*Dr.* Tls. 81,060	31-12-05	Tls. 5 for 1902	....	Tls. 10 sellers
Philippine Co., Ld.	1904	$675,000	67,500	$10	$10	none	*Dr.* P. 34,324	31-12-05	None	....	$5 buyers
Shanghai Gas Co., Ld.	1903	Tls. 800,000	24,000	Tls. 50	Tls. 50	*d* Tls. 100,000	Tls. 7,990	31-12-06	Final of Tls. 3½ and bonus of Tls. 1½ for year ending 31-12-06	4½	Tls. 110 sales
Shanghai Horse Bazaar Co., Ld.	1904	Tls. 270,000	5,400	Tls. 50	Tls. 50	Tls. 45,000	Tls. 9,751	31-12 04	Tls. 6 for 1904	....	Tls. 38
Shanghai Pulp & Paper Co., Ld.	....	Tls. 450,000	4,500	Tls. 100	Tls. 100	Tls. 45,000 *e* Tls. 8,000	Tls. 3,354	31-12-06	Final of Tls. 5 making Tls. 10 for 1906	9	Tls. 110 sellers
Shanghai-Sumatra Tobacco Co. Ld.	1902	Tls. 600,000	9) 30,000	Tls. 20	Tls. 20	Tls. 24,820 *w* Tls. 50,000	Tls. 7,843	31-10-06	Final of Tls. 6 making Tls. 10 for 1906	8¾	Tls. 115 sales
Shanghai Waterworks Co., Ld.	1881	£288,000	8,175 7,200	£20 £20	£20 £15	Tls. 190,000	Tls. 85,592	31-12-05	Int. div. of 15/- for half-year 06 Int. div. 5/- for half-year 1906	....	Tls. 340 sales Tls. 285
South China Morning Post, Ld.	1903	$150,000	6,000	$25	$25	none	*Dr.* $41,934	28-2-06	None	....	$25
Steam Laundry Co., Ld.	1902	$100,000	20,000	$5	$5	none	214	31-5-06	30 cents (old) and 15 cents (new) for year ended 31-5-06	4½	$7 sales
Tientsin Waterworks Co., Ld.	1901	Tls. 200,000	2,000	Tls. 100	Tls. 100	Tls. 15,259 *c* Tls. 4,000	Tls. 1,012	30-4-05	Interim of Tls. 4 for year 1905-6	7½	Tls. 100 buyers
Union Waterboat Co., Ltd.	1905	$500.000	16) 50,000	$10	$10	none	$349	31-12-06	First year	....	$11½ buyers
United Asbestos Oriental Agency, Ld.	1896	$100,000	9,900	$10	$4	$25,000	$752	31-5-06	70. cts for year ended 31-5-06	8¾	$10
Do (Founders')			100	$10	$10				$9.90	6½	$150
Watson (A. S.) & Co., Ld.	1886	$900,000	90,000	$10	$10	$300,000 $25,000	$7,734	31-12-05	Interim of 40 cts. % 1906	8½	$12½ sellers
William Powell, Ld.	1901	$150,000	15,000	$10	$10	*c* $4,500	$182	30-6-06	Final of 30 cents making 80 cents for year ending June 30th 1906	10	$8
Weeks & Co., Ld.	....	$381,360	20,000	$20	$20	Tls. 15,000	$3,536	28-2-06	Interim of 80 cts. % 1906	10	$21 buyers

LOANS AND DEBENTURES.	AGENTS FOR THE LOAN.	AMOUNT OF LOAN.	PAR VALUE	OUTSTANDING BONDS.	WHEN PAYABLE.	CLOSING QUOTATIONS.
China Government, 7 per cent. Silver Loan 1886 E	Hongkong&Shanghai Banking Corporation.	Tls. 767,200	Tls. 250	1914	Mar. 31st and Sept. 30th each year until Mar. 31st, 1917	par.
Hongkong Hotel Company, Ltd., 6 per cent. Mortgage Debentures of 1899 ‡	Hongkong&Shanghai Banking Corporation.	$500,000	$500	§ all	Half yearly, June 30th and December 31st	par.
Shanghai & Hongkew Wharf Company, Ltd., 6 per cent. Debentures of 1902	Hongkong&Shanghai Banking Corporation.	Tls. 543,900	Tls. 100	....	Half yearly, June 30th and December 31st	Tls. 98
Astor House Hotel Company, Ltd., 8 per cent. Debentures of 1903	Hongkong&Shanghai Banking Corporation.	Tls. 500,000	Tls. 100	....	Half yearly, January 1st and July 1st	Tls. 101
Chinese Engineering & Mining Co., Ltd., 6 per cent. Debentures of 1903 †	....	£500,000	¶	£431.960	Half yearly, June 30th and December 31st	par.
International Cotton Manufacturing Co., Ltd. 7% Debentures of 1901	Russo Chinese Bank	Tls. 500,000	Tls. 100	‖	Half yearly, March 31st and Sept. 30th	Tls. 97½.

(Closing quotations: Plus accrued interest)

a Authorized capital $2,000,000.
b Building Reserve Account.
c Capital Reserve Fund.
d Depreciation Fund.
e Equalization of Dividend Fund.
f Exchange and Investment Fluctuation Account.
g Gold Reserve Fund
h Exchange Reserve Account.
i Insurance Fund.
j Reinsurance Fund.
k Contingencies Account.
l Legal Reserve Fund.
m Authorized Capital
n Sinking Fund.
o Raw Sugar Reserve Account.
p Premium on New Issue.
q Boiler Repairs and Renewals Account
r Repairs and Renewals Account.
s Silver Reserve Fund.
t Depreciation and Repairs Account
u Underwriting Suspense Account.
v Special account
w Special Works Fund.
x Extra Reserve Fund.
y 72,560 owned by the Company.
z 7,200 shares unissued.
1 5,725 shares unissued.
2 First issue of 60,000 of which 10,411 unalloted.
3 5,000 shares unissued.
4 4,480 shares unissued.
5 5,900 shares unalloted.
6 1,616 shares unalloted.
7 842 shares unissued.
8 14,000 shares unissued.
9 17,000 shares unissued.
10 0,453 shares actually issued.
11 7,688 shares actually issued.
12 4,200 shares unissued.
13 500 shares unissued.
14 198 shares unissued.
15 50,000 shares unissued.
* Based on last year's dividend.
** Based on present dividend.
‖ Only Tls. 134,000 taken up.
§ 216 held by the Company.
¶ In certificates of £20 and £100.
‡ Redeemable in 10 years, or at option of Company, the Company giving 6 months notice.
† Redeemable at par at rate of £10,000 per annum from 31st December 1903 to 31st December 1952.
Dr Deficit.

SINGAPORE SHARE QUOTATIONS

(COURTESY MESSRS. FRASER & CO., BROKERS, SINGAPORE, MAY, 1907)

Date of Formation	Capital	Capital paid up	No. of Shares Issued	Issue Value	Paid up	Reserve	Last Dividend	Name	Buyers	Sellers	Closing Quotations
								MINING			
1903	$300,000	300,000	30,000	10	10			Belat Tin Mining Co., Ltd	19.75	20.00	$20.00
1907	$300,000	225,000	22,500g*	10	10			Bruang Ltd	....	....	10.50
1903	£400,00	350,000	350,000a	1	1			Duff Development Co., Ltd	2.75	3.00	3.00
1901	$600,00	600,000	60,000	10	10		10% interim for 1906	Bruseh Hydraulic Tin Mining Co., Ltd	....	....	19.00
1905	£30,000	30,000	30,000	1	1		3/- during 1906	Jeher Hydraulic Tin Mine, Ltd	....	17.50	17.50
1907	$400,000	$375,000	37,500b	10	10			Kanaboi, Ltd	....	10.50	10.50
1901	£60,000	60,000	60,000	£1	£1		-/6 interim for 1907	Kinta Tin Mines, Ltd	....	11.25	11.25
1906	£100,000	£90,000	90,000c	£1	£1			Kledang Tin Mining Co., Ltd	....	14.50	14.50
1905	$150,000	99,000	9,900d	10	10	6,000	55% for 1906	Kuantan Tjn Mining Co., Ltd	....	21.00	21.00
1906	£120,000	£120,000	120,000	1	1			Lahat Mines Ltd	....	11.50	11.50
1906	$450,000	$225,000	45,000	10	5			Malacca Tin Dredging Co., Ltd	....	4.00	4.00
1906	£250,000	£145,000	600,000	5/-	2/6			Pahang Consolidated Co., Ltd	....	17/6	17/6 prem.
			100,000	£1	£1			" " " 7% *Pref*	....	....	nominal.
1904	£120,000	98,000	98,000e	1	1		2/6 interim for 1907	Pusing Lama Tin Mines, Ltd	....	24.00	24.00
1905	£27,000	21,750	21,750f	1	1			Rambutan, Ltd	....	24.25	24.25
1892	£200,000	191,250	50,000	1	1	4,873	1/- paid January 1901	Raub Aust Gold Ming Co., Ltd, *Fully. pd.*	....	6.00	6.00
			150,000	1	18/10		1/- " " "	*Contrib.*	....	6.00	6.00
1905	£40,000	35,200	35,200g	1	1			Redhills Tin Mining Co., Ltd	....	24.50	24.50
1898	f.2,000,000	1,800,000	18,000	100	100		52½% for yr. end. 31-12-06	Redjang Lebong Mining Co	....	....	625.00
1900	$110,000	110,000	22,000	5	5		5% interim paid Sept. 1906	Royal Johore Tin Mining Co., Ltd	....	3.50	3.50
1906	$80,000	80,000	8,000	10	10			Serem. Sungei Rayah Tin Ming. Co., Ld	....	3.50	3.50
1906	$850,000	850,000	85,000	10	10		12½% interim for 1907	Serendah Hydrlc Tin Ming. Co., Ltd	....	18.25	18.25
1899	$230,000	230,000	23,000	10	10		5% for ½ year ending 30-6-06	Sipiau Tin Co., Ltd	....	8.00	8.00
1902	£160,000	149,185	149,185h	1	1		2/- interim for 1907	Tronoh Mines, Ltd	....	23.00	23.00
								RUBBER			
1905	£150,000	104,937-10	46,500i	1	1			Anglo-Malay Rub. Co., Ltd. *Fully paid*	....	....	£3 12s. 6d.
			93 500	1	12/6			" " " *Contributory*	....	....	£3 2s. 6d.
1905	$200,000	87,400	1,700j	10	10			Balgownie Rub. Estate Ltd. *Fully paid*	....	....	$19.00
			8,800	10	8			" " " *Contributory*	....	....	$17.00
1904	£30,000	11,125	7,000k	1	1			Batu Caves Rub. Co., Ltd. *Fully paid*	....	....	£2 2s. 6d.
			11,000	1	7/6			" " " *Contributory*	....	....	£1 12s. 6d.
1905	$700,000	610,000	61,000l	10	10			Batu Unjor Rubber Co., Ltd	....	20.50	$20.50
1903	£70,000	61,000	61,000m	1	1		5% interim for 1906	Bukit Rajah Rubber Co., Ltd	....	....	£4 15s. 0d.
1906	$150,000	125,000	12,500n	10	10			Castlewood Rubber Co., Ltd	....	9.00	$9.00
1904	£12,000	10,500	6,000	1	1		5% to 31-3-06	Cicely Rubber Estates Co., Ltd	....	....	£2 16s. 0d.
			6,000	1	15/-		10% to 31-3-06	" " " " 5% *Pref*	....	....	£2 16s. 0d.
1905	£75,000	55,000	55,000o	1	1			Consolidated Malay Rub. Estates, Ltd	....	....	£2 7s. 6d.
1906	£310,000	227,783-15	181,454p	1	1			Highlands & Lowds. Para Rub. Co., Ltd. *Fully paid*	....	....	£2 2s. 0d.
			123,546	1	7/6			" " " " *Contributory*	....	....	£1 7s. 6d.
1906	£180,000	£180 000	18,000	1	1			Kuala Lumpur Rubber Co., Ltd	....	....	
1906	f175,000	f.117,500	80	f.250	250			Langen Rub. and Cocoanut Co., Ltd	....	....	f.250.
			460	f.250	125			" " " " " "	....	....	f.125.
			160	f.250	250			" " " " " "	....	....	f.250.
1906	$250,000	225,000	22,500q	10	10			Ledbury Rubber Co., Ltd	....	11.50	$11.50
1895	£50,000	32,332 10	10,060	1	1			Linggi Plantations Ltd., 7% *Pref*	....	....	
			10,000	1	1		5% for 1906	" " " *Ordinary*	....	....	£3 10s. 0d.
			10,000	1	1				....	....	
			10,000	1	5/-				....	....	£2 10s. 0d.
1906	£300,000	260,625	115,000	1	1		3¼% interim for 1906	Malacca Rnbber Plantations 7½% *Pref*	....	....	£1 3s. 0d,
			140,000	1	1			" " Ordinary *Fully paid*	....	18/-	18/-
			45,000	1	2/6			" " *Contributory*	....	....	nominal.
1903	£30,000	20,000	20,000r	1	1		10% interim for 1906.	Pataling Rnbber Estates Syud. Ltd	....	....	£6 1s. 3d.
1904	$200,000	135,000	1,350s	100	100			Ribu Planting Co., Ltd	....	....	$200.00
1904	$100,000	85,000	850t	100	100		20% for year ending 31-1-07	Sandycroft Rubber Co., Ltd	....	305.00	$305.00
1898	£30,000	26,762,10	26,300	1	1		15% for ½ year end. 30-6-06	Selangor Rnbber Co., Ltd	....	....	£7 10s. 0d.
			3,700	1	2/6			" "	....	....	nominal.
1903	$250,000	148,000	1,300u	100	100			Sing. & Johore Rub. Co., Ltd. *Fully paid*	180.00	....	$180.00
			1,200	100	40			" " " *Contributory*	110.00	....	$110.00
1905	$100,000	83,550	8,335v	10	10			Sione Rubber Co., Ltd	....	14.50	$14.50
1904	£50,000	24,420	6,920w	1	1			Sungei Way (Selangor) Rub. Co. Ltd	....	....	£2 5s. 3d.
			35,000	1	10/-			" " " *Contributory*	....	1.15.3	£ 1 15s. 3d.
1904	£60,000	50,000	50,000x	1	1			Vallambrosa Rubber Co., Ltd	....	....	£6 0s. 0d.
								CENTRAL			
1894	£5,377.10.0	£4,648.15.	7,438	12/6	12/6	£814,11.9	10% dividend for 1905	Bells Asbestos Eastern Agency, Ltd	....	....	7.00
1898	$225,000	225,000	4,500	50	50	112,500	15% & 2½% bon. for yr. end. 31-12-06.	Fraser & Neave, Ltd	135.00	136.00	135.00
1865	$10,000,000	10,000,000	80,000	125	125	10,000,000b* 11,000,000c* 250,000d*	£1 15s. & bonus of £1 at ex. 2s. 3⅛d. making $40.80 for 1906	Hongkong & Shanghai Bankg Corptn	....	....	855.00
1905	$2,400,000	2,400,000	18,000	100	....	40,000	7½% for year ending 31-10-06	Howarth Erskine, Ltd	....	175.00	175.00
			6,000	100	....		7% for year ending 31-10-06	" " 7% *Pref*	....	....	120.00
1896	$1,000,000	1,000,000	6,000	100	100	600,000	10% for year ending 31-12-06	Katz Brothers, Ltd. *Deferred*	....	....	135.00
			4,000	100	100		8% " " " " "	" " 8% *Cum. Pref*	....	....	nominal.
1901	$34,000	34,000	3,400	10	10		20% for year ending 31-10-06	Maynard & Co., Ltd	....	....	21.00
1899	$875,000	875,000	6,000	100	100	150,000	5% for year 1906	Riley, Hargreaves & Co., Ltd	....	105.00	105.00
			2,750	100	100		7% for year 1906	" " " " 7% *Pref*	....	....	110.00
1903	$600,000	240,000	24,000y	10	10			Singapore Cold Storage Co., Ltd	....	8.75	8.75
1891	$30,000	30,000	600	50	50	20,000	10% for year ending 31-7-06	Singapore Dispensary Ltd	....	55.00	55.00
1884	$200,000	200,000	2,000	100	100	35,000	20% for year ending 31-12-05	Straits Ice Co., Ltd	....	165.00	165.00
1890	$500,000	500,000	5,000	100	100	400,000 241,075e*	10% for 1906	Straits Steam Ship Co., Ltd	165.00	....	165.00
1904	$40,000	$30,280	2,535z	10	8			Straits Tobacco Factory, Ltd	....	....	4.00
			1,000	10	10			" " " "	....	....	nominal.
1887	$3,000,000	2,500,000	250,000a*	10	10	1,000,000 1,087 084f*	10% & 5% bon. ½ yr. end. 30-9-06	Straits Trading Co., Ltd	....	65.00	65.00
1864	$3,700,000	3,700,000	37,000	100	100	1,950,000	$6 for half year ending 31-12-06	Tanjong Pagar Dock Board	740.00	....	740.00
								DEBENTURES			
								Howarth Erskine, Ltd. 6% 600,000	....	....	3% prem.
								Singapore Municipal 6% 400,000	....	....	2% prem.
								" " 4% 1,878,000	....	....	2% prem
								" " 5% 602,900	....	....	2% dis. nom.
								Riley, Hargreaves & Co., Ld. 6% 225,000	....	....	3% prem.
								Tanjong Pagar. Dock Board 6% 250,000	....	....	3% prem.
								" " " 5% 1,050,000	....	....	par.

a 50,000 unissued
b 2,500 "
c 10,000 "
d 5,100 "
e 22,000 "
f 5,250 "
g 4,800 "
h 10,815 "
i 10,000 "
j 9,500 "
k 12,000 "
l 9,000 unissued.
m 9,000 "
n 2,500 "
o 20,000 "
p 5,000 "
q 2,500 "
r 10,000 "
s 650 " Mort. £5,000
t 150 "
u 300 "
v 1,645 "
w 8,080 unissued.
x 10,000 "
y 36,000 "
z 465 "
*a** 50,000 "
*b** Special Gold Reserve Fund
*c** Silver Reserve Fund.
*d** Insurance Fund.
*e** Sundry Reserves.
*f** Sundry Reserves.
*g** 7,500 unissued.

BIDS FOR STEEL LAUNCHES AND LORCHAS

The chief quartermaster of the Division of the Philippines has advertised for bids for the construction of five steel launches, eight steel lorchas, one steel hull and eight boilers, to be opened June 15th. Specifications are on file with the American consuls in Hongkong, Singapore and Shanghai. The advertisement appears in another column of this issue of the FAR EASTERN REVIEW.

YUNNAN RAILWAY.—47,000 workmen are on the work of the Yunnan-Mentze Railway day and night, so as to get it finished as soon as possible.

SHANSI MINING DISPUTE —Gentry of Shansi Province have already collected 300,00o taels with which they propose to organize a Mining Company, but the British Minister has protested, declaring that it is a menace to the Concession procured by the Peking-Syndicate.

YOKOHAMA SHARE QUOTATIONS

COURTESY A. C. HUTTON POTTS, SHARE AND GENERAL BROKER, YOKOHAMA, MAY 1907

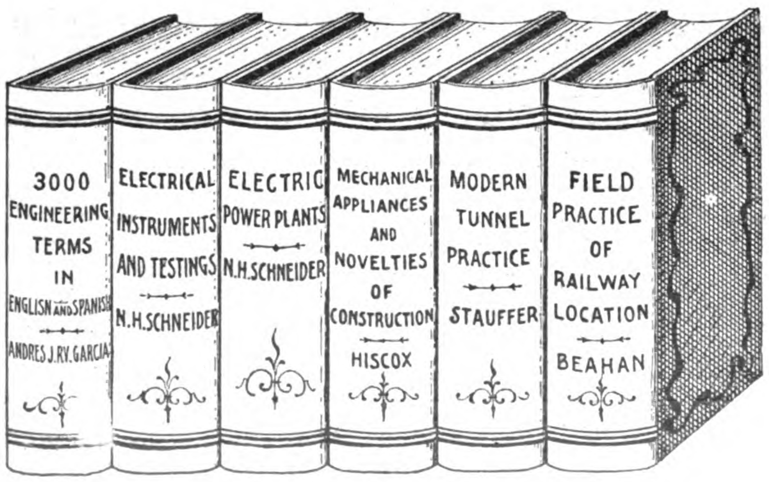
STOCKS	CAPITAL.	NO. OF SHARES	ISSUE VALUE	AMOUNT PAID UP	RESERVED FUND	AT WORKING ACCOUNT OR CARRIED FORWARD	DATE	LAST DIVIDEND	FOR TERM	CLOSING QUOTATION
Brett & Co., Ltd.	-Y- 28,000	2800	10	10			31-12-06	8%	for 1 year	9 Sellers.
Club Hotel, Ltd.	185,000	1850	100	100			31-3-06	5%	for 1 year	90 Sellers.
Grand Hotel, Ltd.	500,000	5000	100	100		-Y- 13,990.77	31-12-06	6%	for ½ year	160 Sellers.
Helm Bros., Ltd.	186,000	3720	50	50	22.500	-Y- 2,916.83	31-12-06	20%	for 1 year	90 Yellers.
Langfeldt & Co., Ltd.	150,000	1500	100	100		Dr. 20.304.15	31-12-06		for ½ year	45 Buyers.
C. Nickel & Co., Ltd. †	500,000	20000	25	25		1,470.97	31-10-06	16%	for 1 year	41 Sellers.
Yokohama Engine and Iron Works *	500,000	10000	50	50	50,000	-Y- 16,282.42	31-5-06	35%	for 1 year	92½ Sales.
Oriental Hotel, Ltd., Ordinary	250,000	3000	50	50	62,285.42		31-8-06	15%	for 1 year	75 Nominal.
Oriental Hotel, Ltd., Preference		2000	50	50				8%	or 1 year	64 Sales.
The Union Estate and Investment Co., Ltd. ‡	1,000,000	10000	100	100			Fisrt Year.			105 Sales.

† 285,000 unissued. *-Y- 390,000 issued.

‡ 475,000 unissued. 110,000 unissued.

DEBENTURE LOANS	AMOUNT OF LOAN.	FACE VALUE OF DEBENTURES.	RATE OF INTEREST.	INTEREST PAYABLE.	CLOSING QUOTATION.
Brett & Company, Limited	11,500.00	100.00	7%	1 June and 1 Dec.	85 Sales.
Yokohama United Club	250,000.00	100.00	7%	30 June and 31 Dec.	106 Nominal.
C Nickel & Company, Limited	50,000.00	100.00	8%	1 May and 1 Nov.	110 Sellers.
Oriental Hotel, Limited	250,000.00	100.00	8%	1 April and 1 Oct.	110 Sellers.
Union Estate and Investment Co., Limited.	250,000.00	100.00	6%	30 June and 31 Dec.	100 Sellers.

JAPANESE STOCKS.	FACE VALUE.	AMOUNT PAID UP.	DIVIDEND PER ANNUM.	DIVIDEND PAYABLE.	CLOSING QUOTATION.
Exchequer Bonds 1st issue	-Y-100	-Y-100	5%	June and Dec.	-Y- 97.00
Exchequer Bonds 2nd issue	100	100	5%	March and Sept.	,, 93.00
Exchequer Bonds 3rd issue	100	100	5%	March and Sept.	,, 93.00
Consolidated Bonds (Seiri)	100	100	5%	June and Dec.	,, 89.40
War Bonds (Gunji)	100	100	5%	June and Dec.	,, 89.40
Imperial 5% Bonds (Goburi)	100	100	5%	March and Sept.	,, 89.50
Imperial Government 5% Bonds (issued 1906)	100	100	5%	June and Dec.	,, 90.00
Kobe Water Works Bonds	100	100	6%	June and Dec.	,, 100.00
Osaka Harbour Bonds	100	100	6%	June and Dec.	,, 100.00
Osaka City Public Loan Bonds	100	100	6%	June and Dec.	,, 100.00
Yokohama Water Works Bonds	100	100	6%	June and Dec.	,, 101.00
Yokohama City Public Loan Bonds	100	100	6%	March and Sept.	,, 100.00
Sanyo Railway Company Debentures (2nd issue)	100	100	6%	April and Oct.	,, 97.50
Tokyo Stock Exchange	50	50	50%	May and Nov.	,, 308.00
Hokkaido Colliery (Tanko) Steamship Company	50	50	15%	June and Dec.	,, 109.00
Hoden Petroleum Company, Limited	50	50	30%	March and Sept.	,, 190.00
Yokohama Electric Tramway Company, Limited	50	50	6%	June and Dec.	,, 54.80
Tokyo Railway Company	50	50		May and Nov.	,, 86.70
Keihin Electric Railway Company, Limited	50	50	13%	May and Nov.	, 105.00
Hokkaido Hemp Weaving Company, Limited	50	50	13%	Jan. and July.	,, 54.90
Kanegafuchi Cotton Spinning Company, Limited	50	50	20%	June and Dec.	,, 112.00
Tokyo Cotton Spinning Company, Limited	50	50	20%	June and Dec.	,, 73.80
Fuji Gassed-Yarn Company, Limited	50	50	25%	June and Dec.	,, 99.50
Nisshin Cotton Spinning Company, Limited	50	12½	—	——	,, 9.65
Fuji Paper Mill Company, Limited	50	50	10%	May and Nov.	,, 57.00
Yokohama Dock Company, Limited	50	33	15%	May and Nov.	,, 72.00
Tokyo Rope Manufacturing Company, Limited	50	50	20%	May and Nov.	,, 120.00
Nippon Sugar Refinery Co., Ltd. Tokyo	50	50	20%	May and Nov.	,, 85.00
Dai Nippon Beer Brewery Company, Limited	50	50	15%	June and Dec.	,, 106.05
Tokyo Gas Company, Limited	50	50	15%	June and Dec.	,, 115.25
Kirin Brewery Company	50	50			,, 110.00
Tokyo Electric Light Company Limited	50	50	12%	May and Nov.	,, 73.30
Yokohama Electric Light Company, Limited	50	50	15%	June and Dec.	,, 115.00
Osaka Electric Light Company, Limited	50	50	13½%	June and Dec.	,, 128.00
Kobe Electric Light Company, Limited	50	50	10%	June and Dec.	,, 100.00



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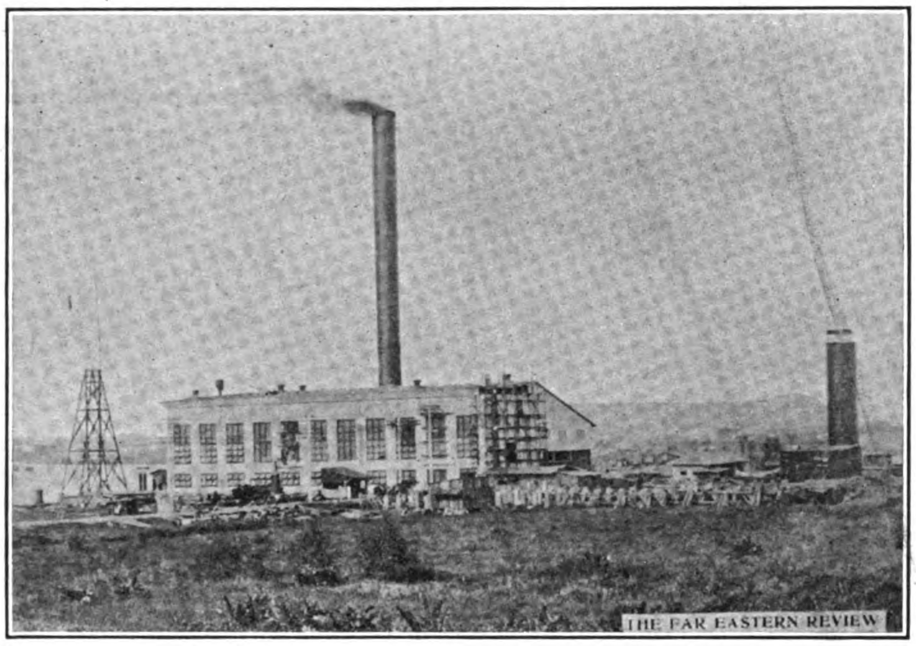

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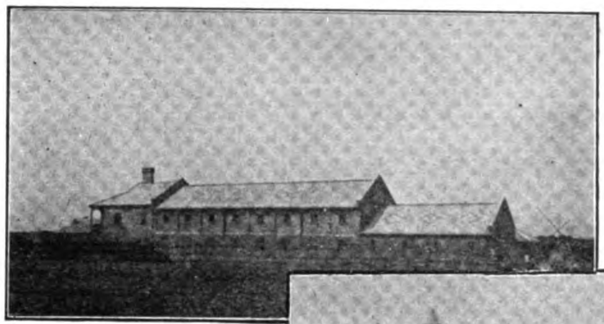

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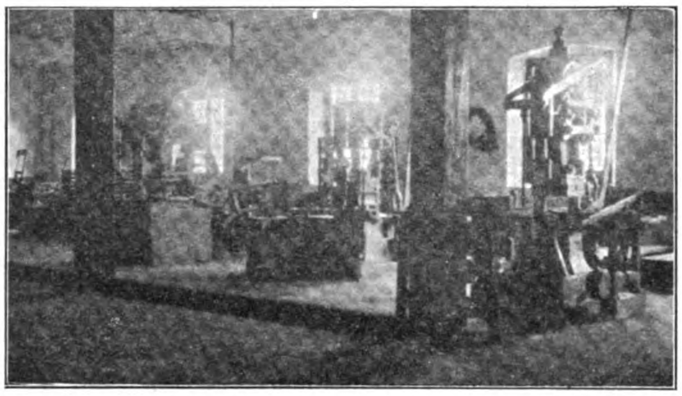

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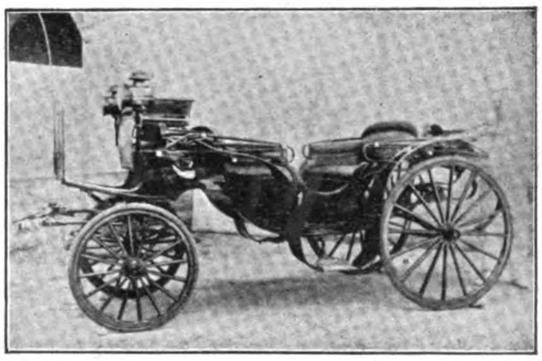

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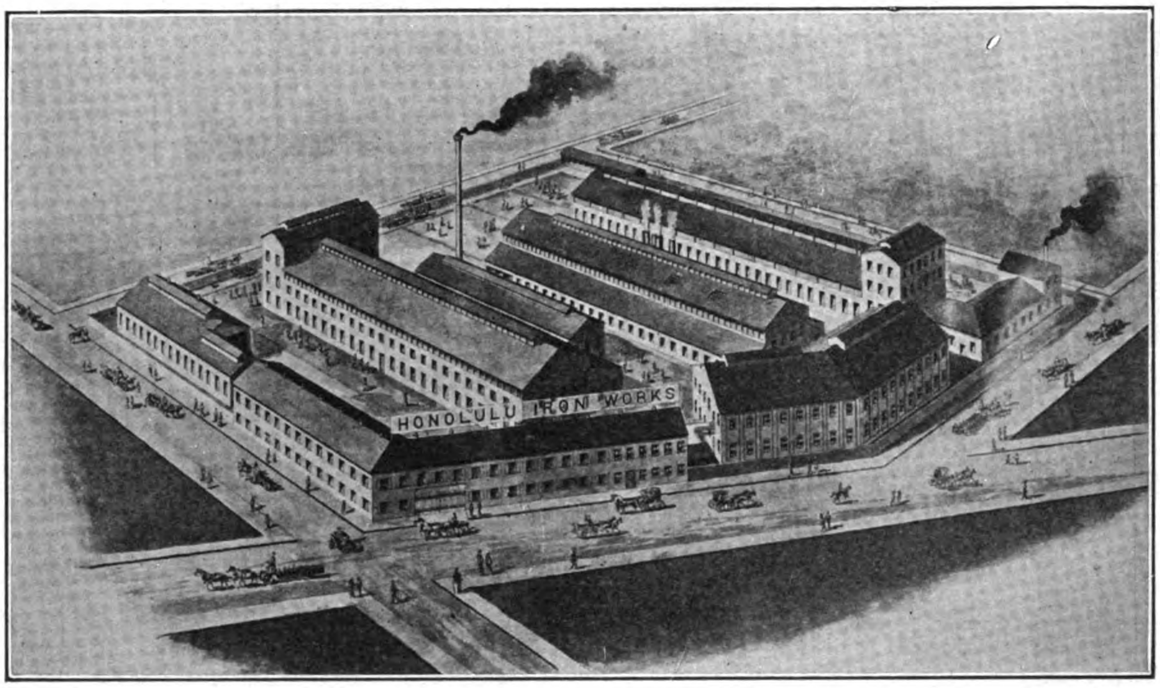

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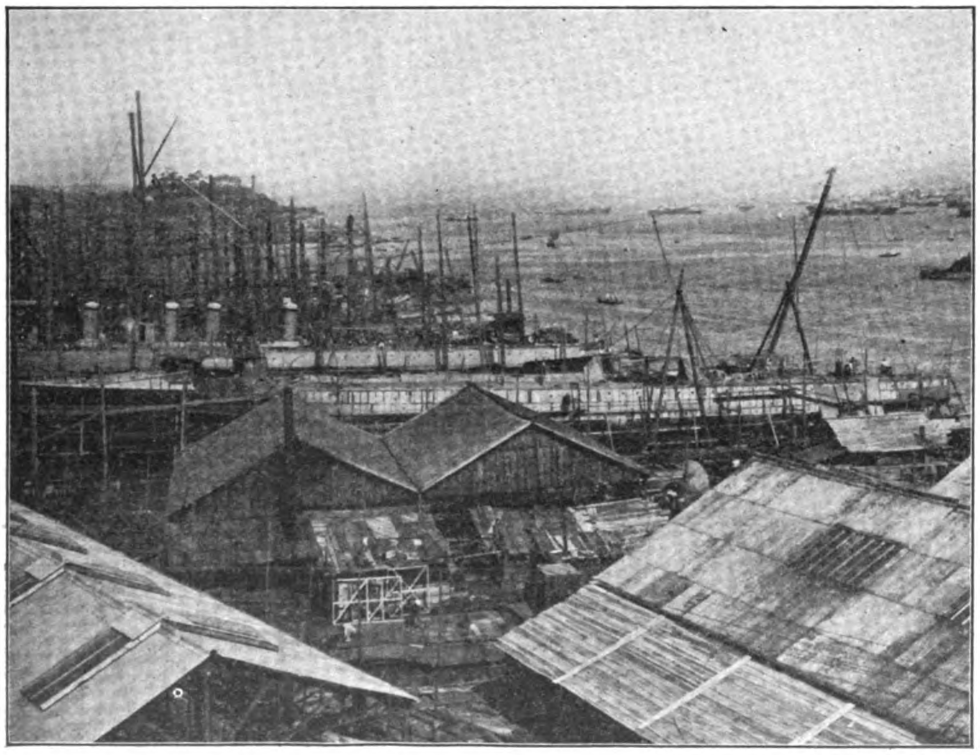

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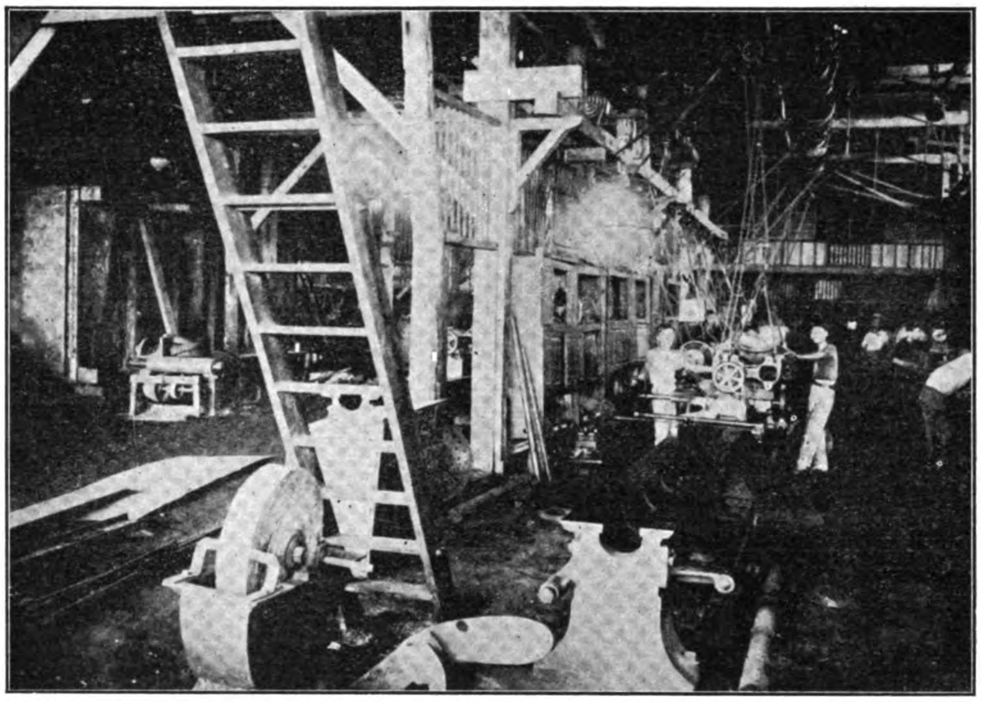

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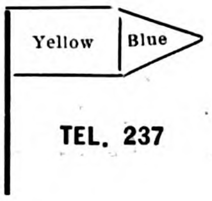

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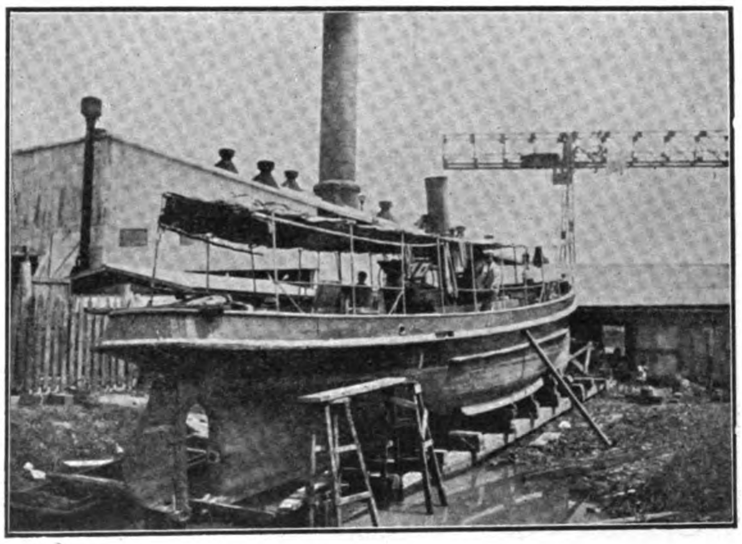

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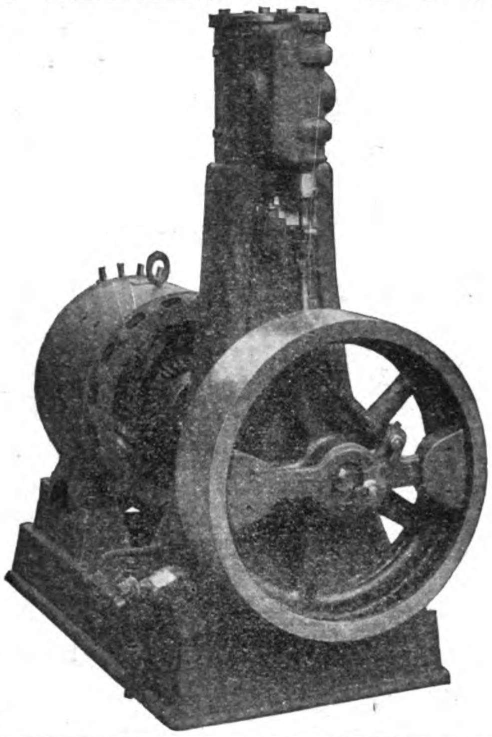

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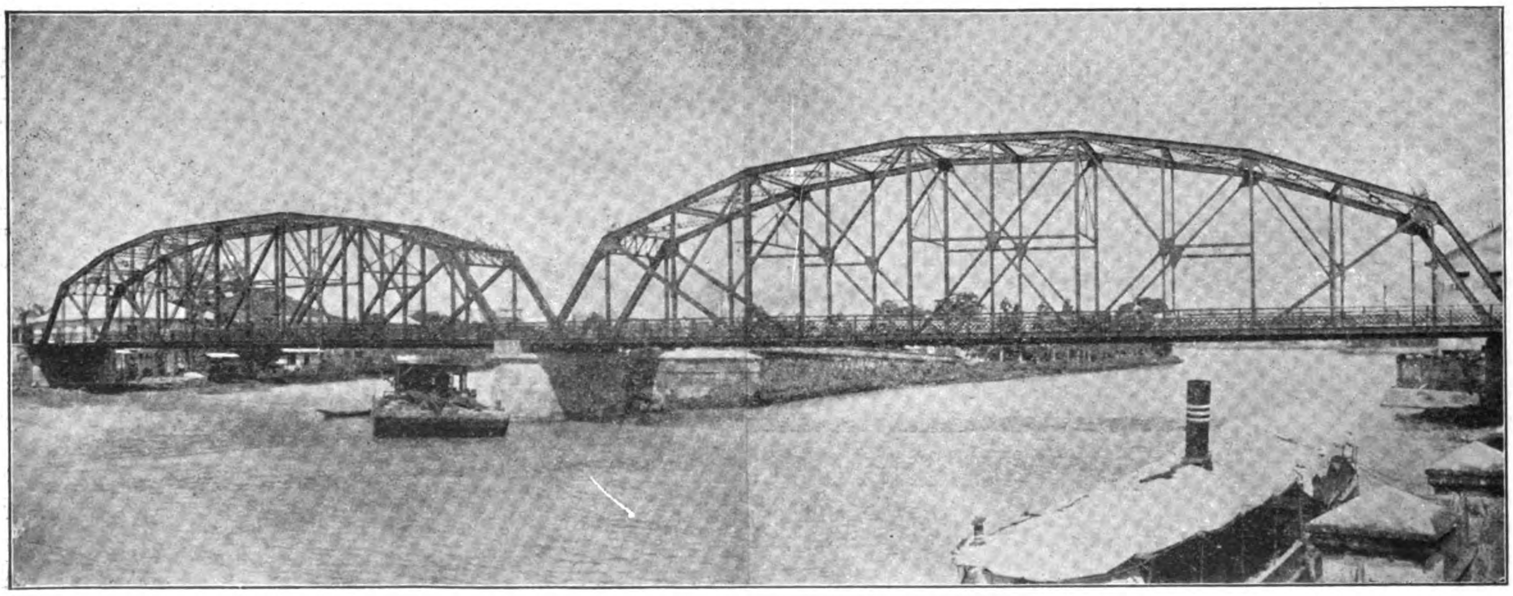

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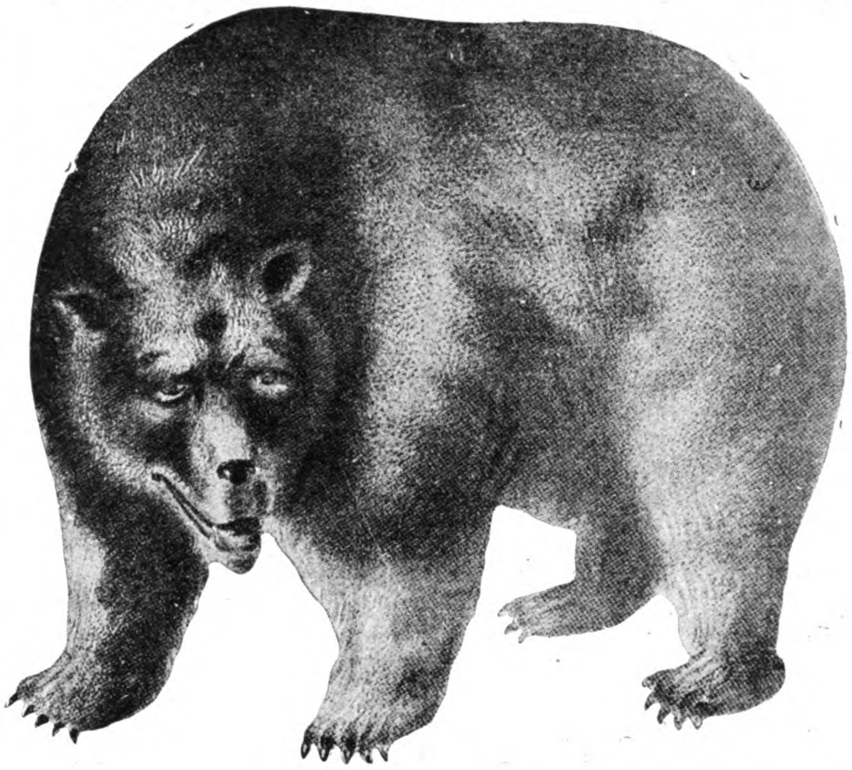

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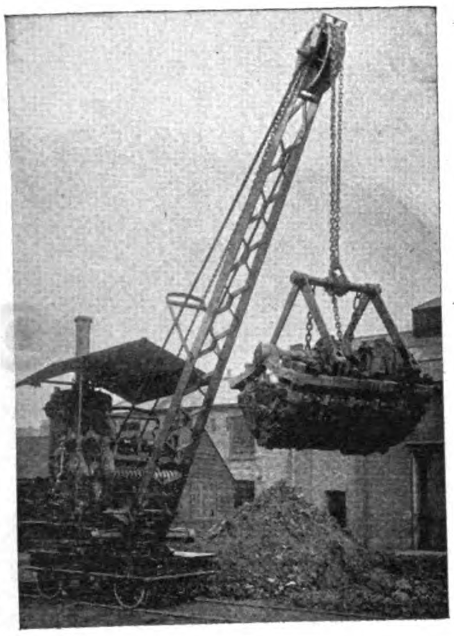

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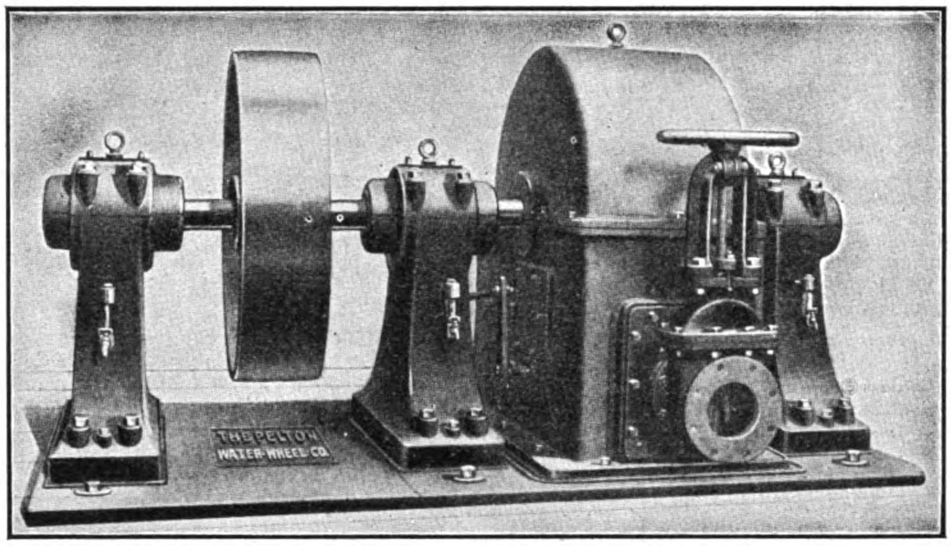

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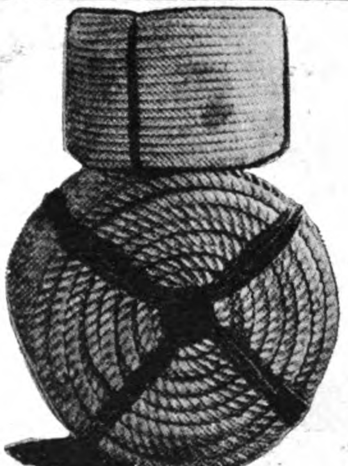

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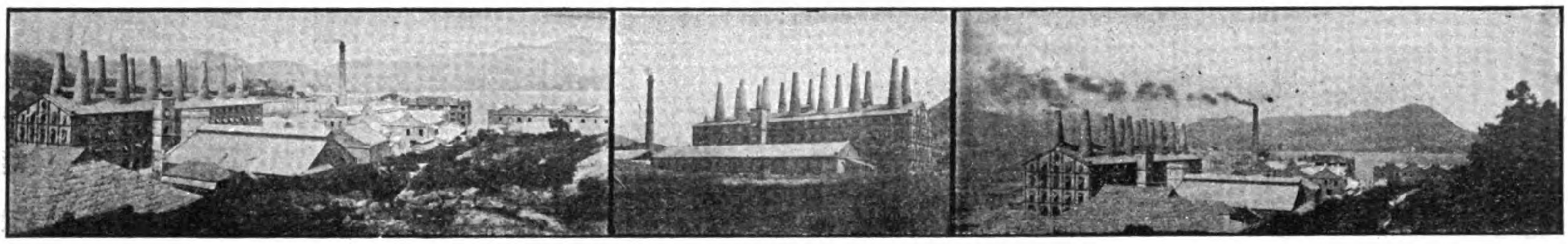

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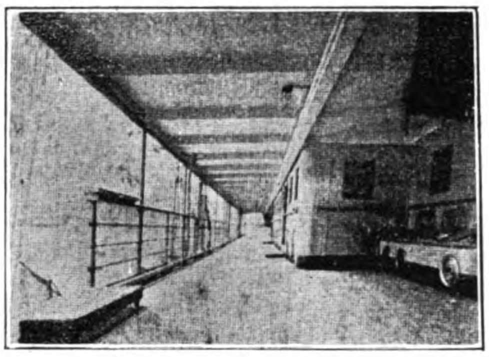

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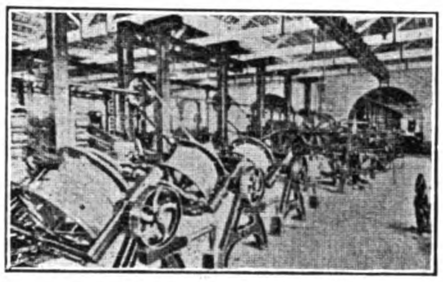

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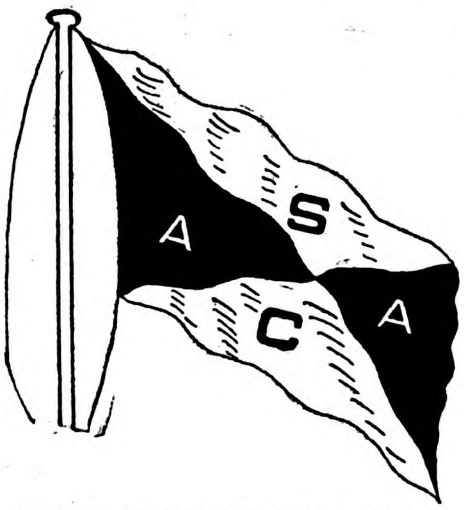

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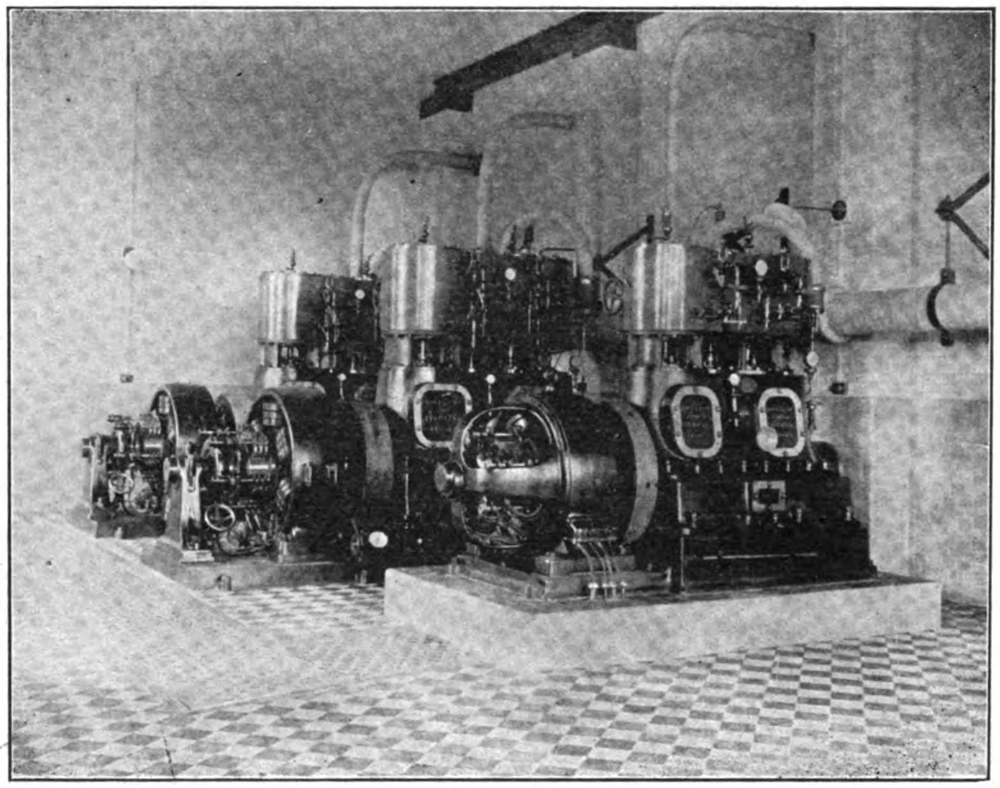

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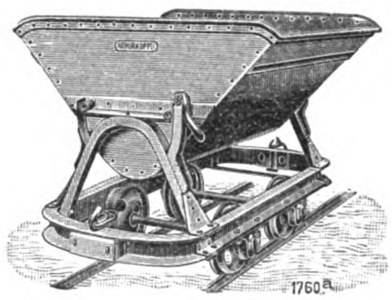

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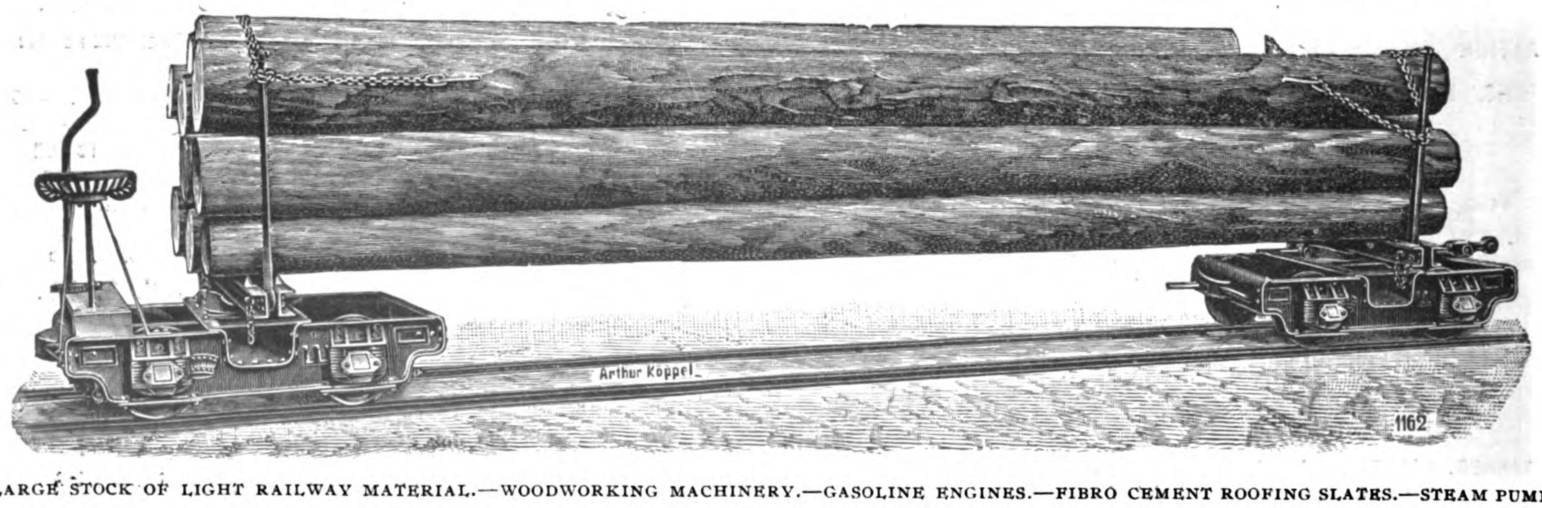

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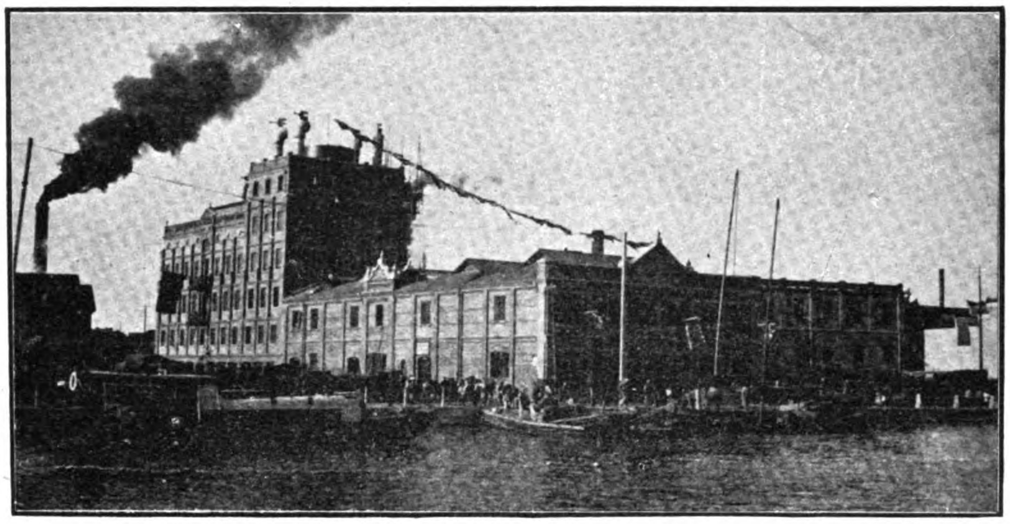

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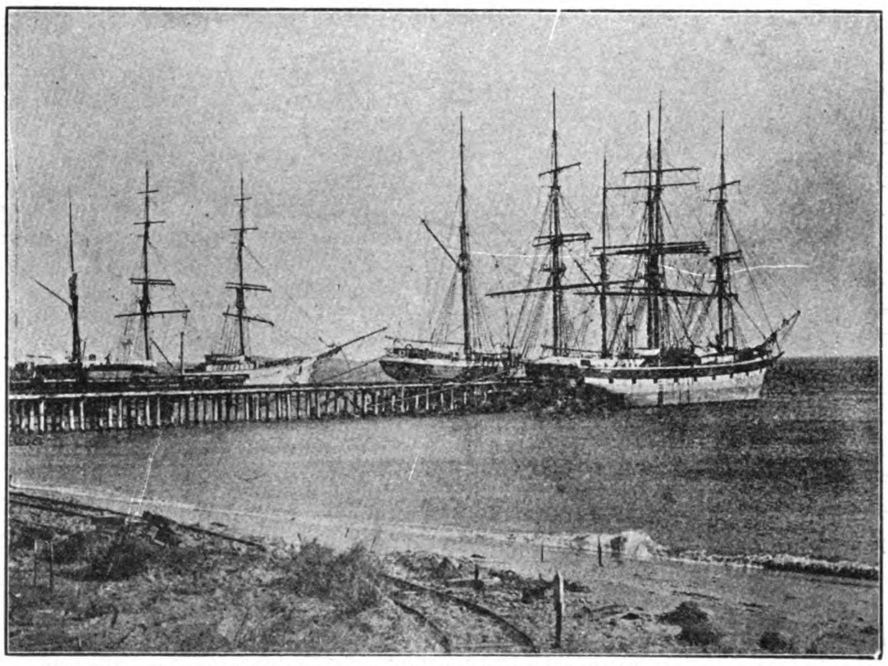

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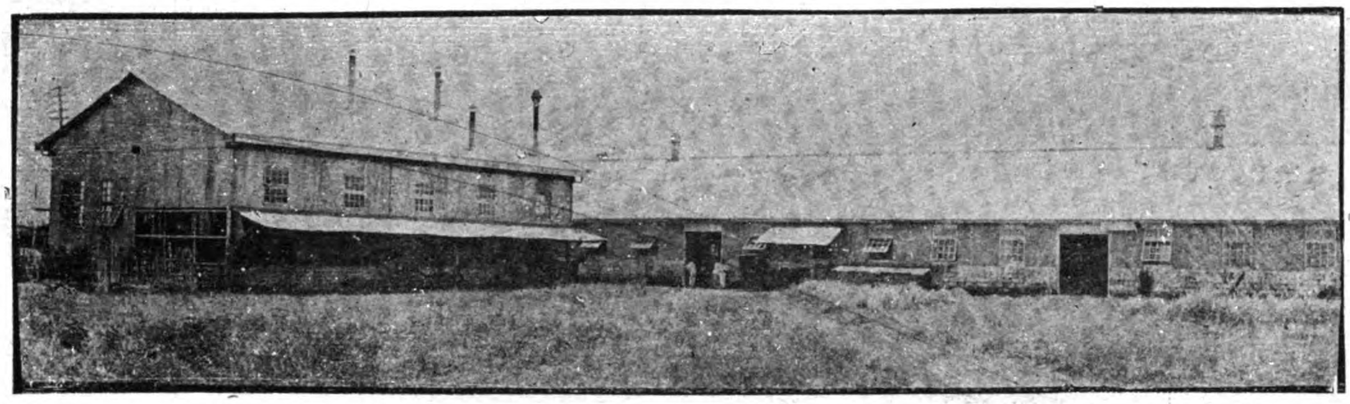

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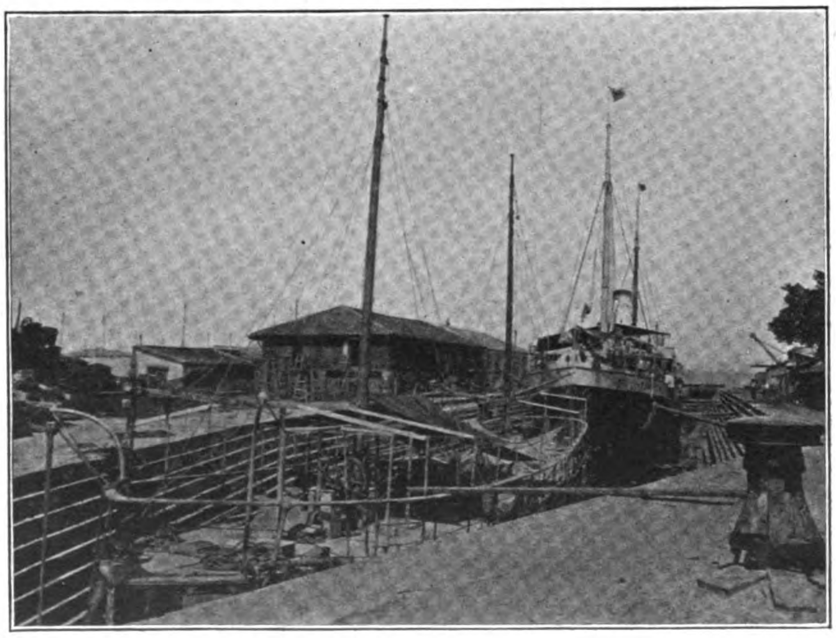

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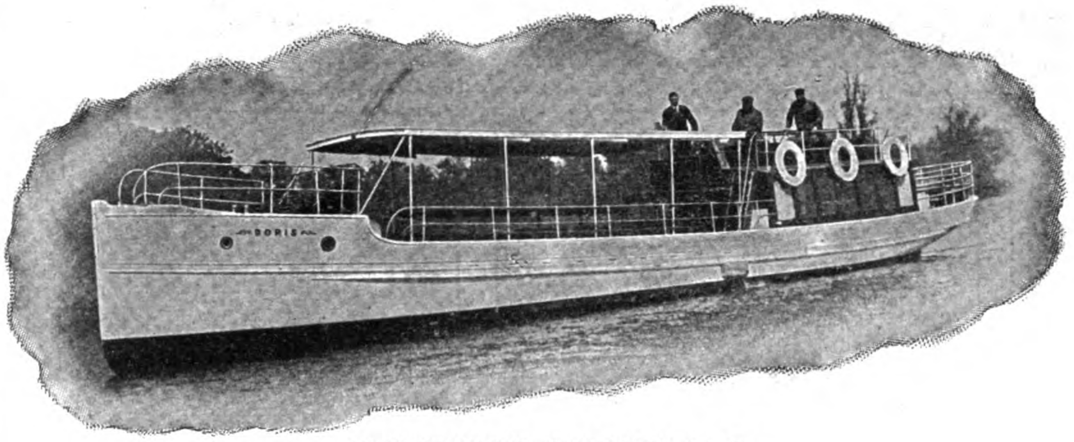

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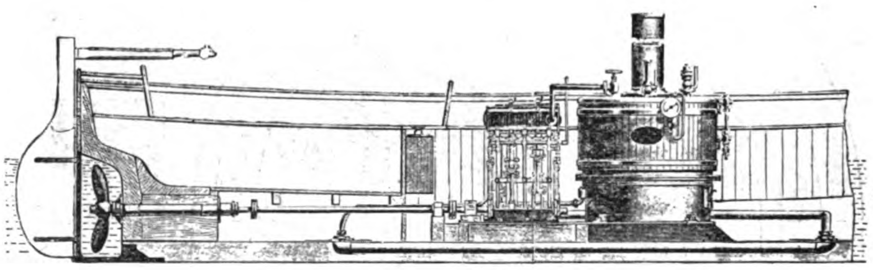

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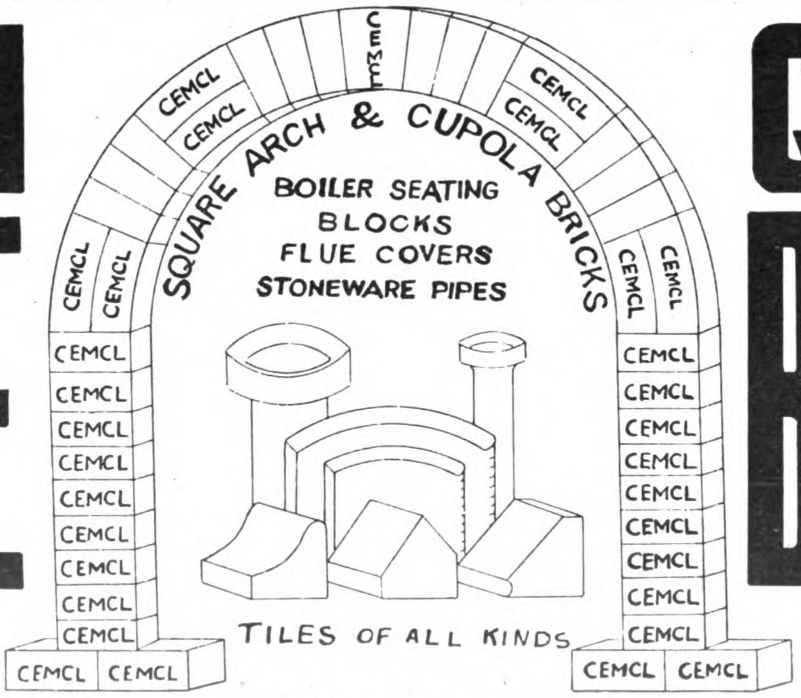

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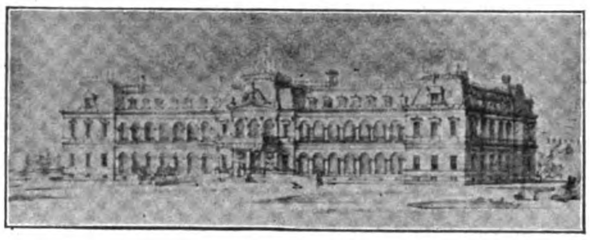

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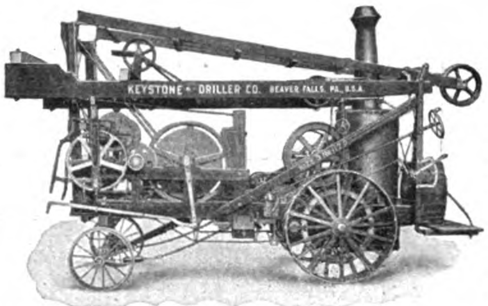

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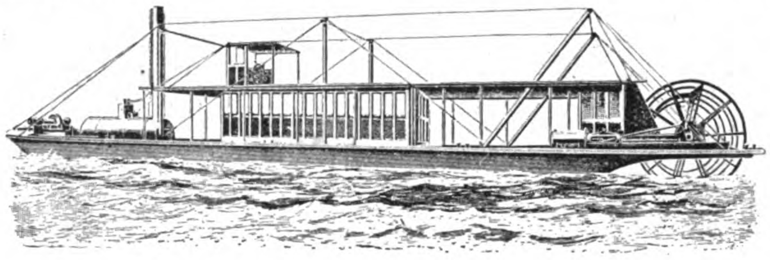

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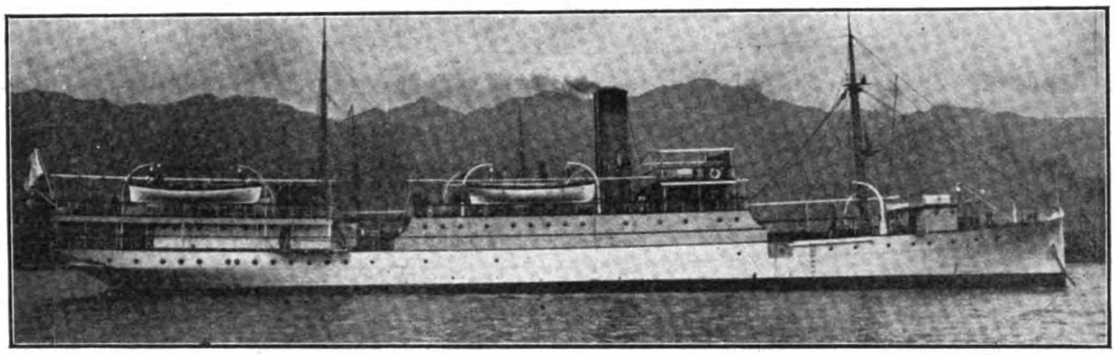

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BOILER PRESERVATIVE E. prevents corrosion and the formation of scale. In boilers where corrosion is taking place it will effectually check it, and all scale will be entirely removed. The use of zinc plates and soda is dispensed with. By using **PRESERVATIVE E.** a boiler can be kept in better condition and at less cost. It is used by all the leading steamship lines and in many large power installations and mills. For water-tube boilers it has been especially recommended, as no matter how bad the feed water no scale is deposited on the heating surfaces, nor is corrosion allowed to take place.

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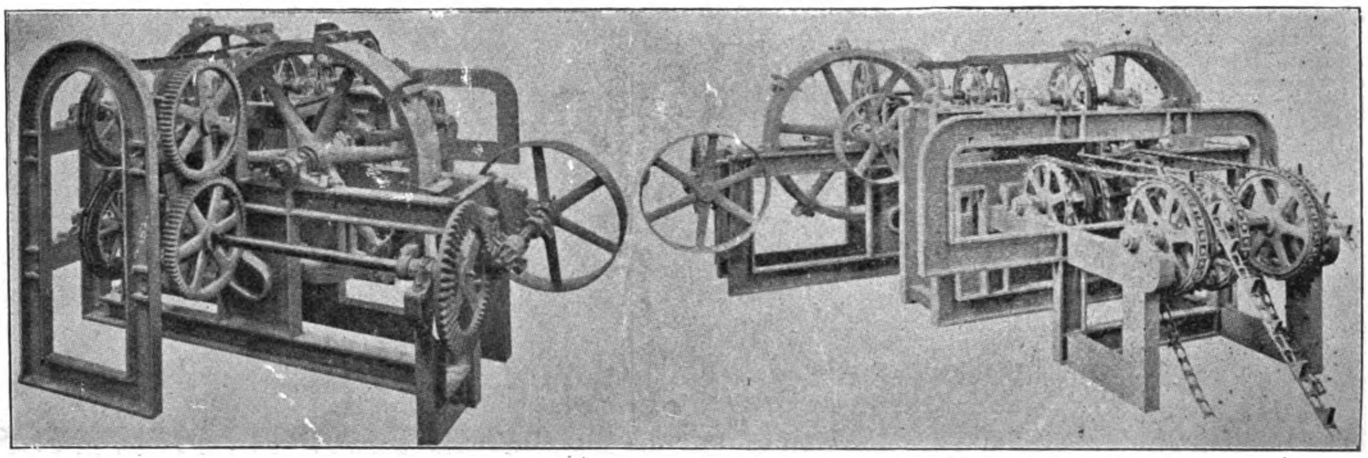

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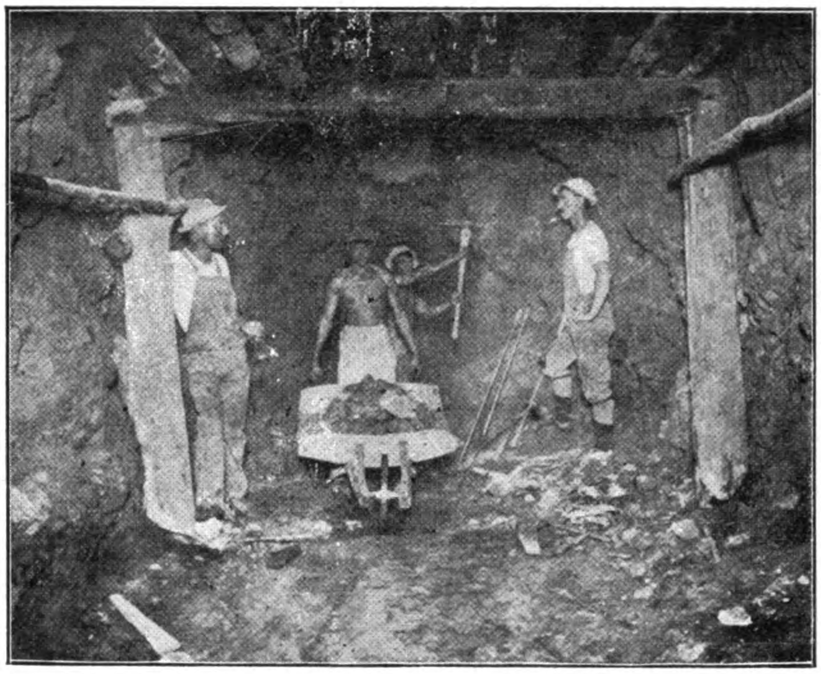
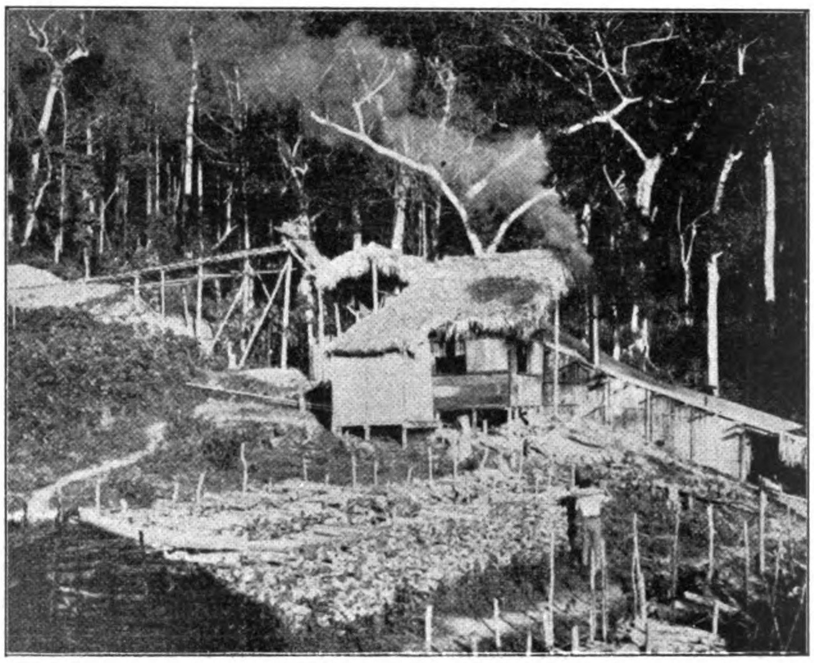


INTERIOR OF "HAVE GOT" TUNNEL



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The property of the Eastern Mining Company is the best developed of those in the Aroroy District on the Island of Masbate, P. I.

From inspection trips of government officials, from preliminary investigations of the Mining Bureau of the Philippines, and from reports of Mining Engineers, it is conceded that the property is one that will, to the fullest degree, justify further development of the mine, and the installation of a suitable plant to treat the ore. There is ore enough "blocked out," in the full engineering significance of the term, to warrant the installation of a plant. From ore tests made by responsible engineers, it is found that there are no undue difficulties in the way of rapid and cheap treatment.

Conditions of mining on the property are excellent. The mines are opened by tunnels and are self-draining. There is ample height above the mine levels for the working of the ore bodies economically and by best methods.

By careful and extensive sampling the values of the ore bodies are assured, and the mine shows ore that can be handled at a handsome profit. The results of the experimental plant show conclusively that estimates and figures are correct and that now the Company is assured of success, by the proper exploitation of the property.

What is needed now is a large milling plant with its increased mine development and for this purpose—for the expansion of the present well proven concern into a large producer,—**a limited amount of treasury stock is offered investors at a low figure, for providing the necessary capital to purchase and install a new 40-stamp mill. For particulars and information apply to either Manila or New York Office.**

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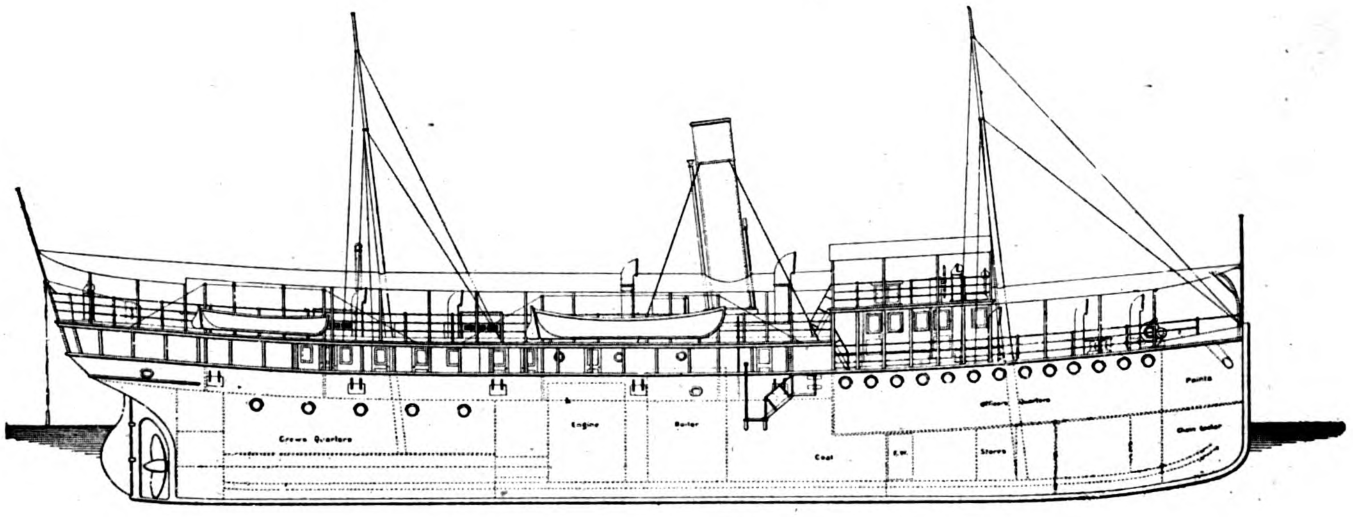

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The Company has SIX GRANITE DOCKS and TWO PATENT SLIPS of the following dimensions:—

NAME OF DOCK OR SLIP	LENGTH ON KEEL BLOCKS	BREADTH AT ENTRANCE	DEPTH OVER SILL AT ORDINARY SPRING TIDES	RISE OF TIDE	
				SPRINGS	NEAPS
KOWLOON	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
No. 1 Dock, Kowloon..........	576	86 feet top / 70 ft. bottom	30′	7′ 6″	3
No. 2 Dock, Kowloon..........	371	74′	18′ 6″	7′ 6″	—
No. 3 Dock, Kowloon...	264	49′ 3″	14′	7′ 6″	—
Patent Slip, No. 1, Kowloon...	240	60′	14′	7′ 6″	—
Patent Slip, No. 2, Kowloon...	220	60′	12′	7′ 6″	—
TAI-KOK-TSUI					
Cosmopolitan Dock...........	466	85′ 6″	20′	7′ 6″	—
ABERDEEN					
Hope Dock..........	430	84′	23′	7′ 6″	—
Lamont Dock.	333	64′	16′	7′ 6″	—

The DOCKS are fitted with every appliance in the way of Caissons, powerful Centrifugal Steam Pumps, etc., which enable them to be pumped out in three hours.

WORKSHOPS.—The extensive workshops on the premises at Kowloon, Cosmopolitan, and Aberdeen Docks possess every facility and appliance necessary for the repairs of ships and steam machinery. The Engineers' Shops are supplied with a large plant of the latest types of tools in the way of Lathes, Planing, Milling and Screwing Machines, Electric Cranes, etc., etc., and capable of executing the largest class of work with despatch. The Shipwrights' Department has attached to it a Steam Sawmill with Circular, Vertical and Band Saws, and also a complete plant of Wood-working Machinery of the most modern and improved type. The Blacksmiths' Shops are equally well furnished with a complete supply of powerful Steam Hammers, Cranes, etc., capable of forging stern posts and crank and straight shafting of the largest size.

Powerful Lifting Shears with steam purchase at two of their Establishments stand on a solid granite seawall, alongside which vessels can lie drawing 24 feet of water, and take in or out boilers, etc. The Shears at Kowloon are capable of lifting 70 tons.

The Company is prepared to tender for the construction of new vessels in either steel, iron or wood, having already built about 400 of varying sizes up to 3,000 tons; also to execute all kinds of ship work at lower rates and with greater despatch than any establishment in the East. Every department is under the close supervision of experienced European foremen.

SHIP-YARD is fully equipped with modern plant, including hydraulic flanging and bending machines, electrically driven rolls, punching, shearing, angle-bevelling, joggling and planing machines, capable of dealing with the heaviest class of work.

BOILER-MAKERS' DEPARTMENT.—The Company, in addition to executing repairs, is prepared to tender for new boilers to steamships for the construction of which it possesses special facilities, including powerful punching and shearing machines, hydraulic rivetters, etc.

FOUNDRY.—The Foundry is fitted with a large powerful Steam Crane and the Cupolas are capable of casting up to 100 tons. The Company is prepared to supply the very best iron and Brass Castings of all descriptions upon the shortest notice.

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STORES.—The Company's Godowns contain large and well-selected stocks of all material and fittings requisite in shipbuilding, engine-room outfits, furnishings, and ships' stores of all descriptions supplied at tariff rates.

For Further Particulars apply at the Offices of the Company, Queen's Buildings, No. 1, New Praya, Hongkong, or to

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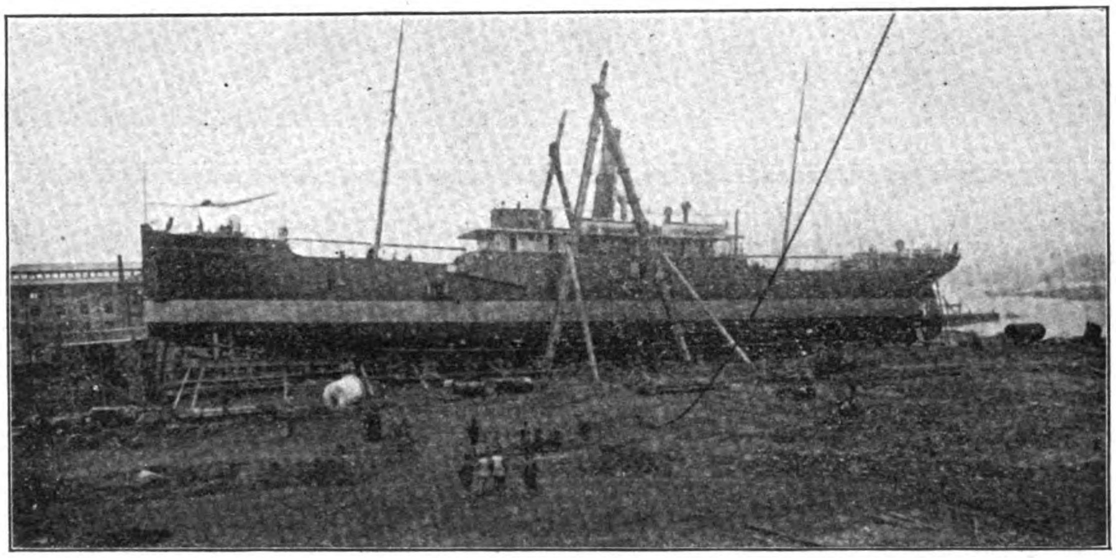

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The Docks are five in number ranging in length from 360 feet to 560 feet, and breadth of entrance from 57 feet to 83 feet, with the depth of water on the sill from 16 feet to 24 feet.

The Dock charges are very moderate.

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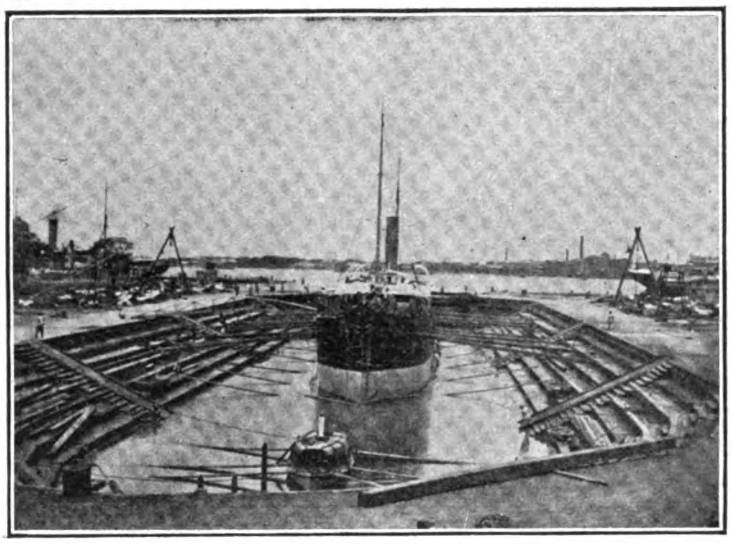

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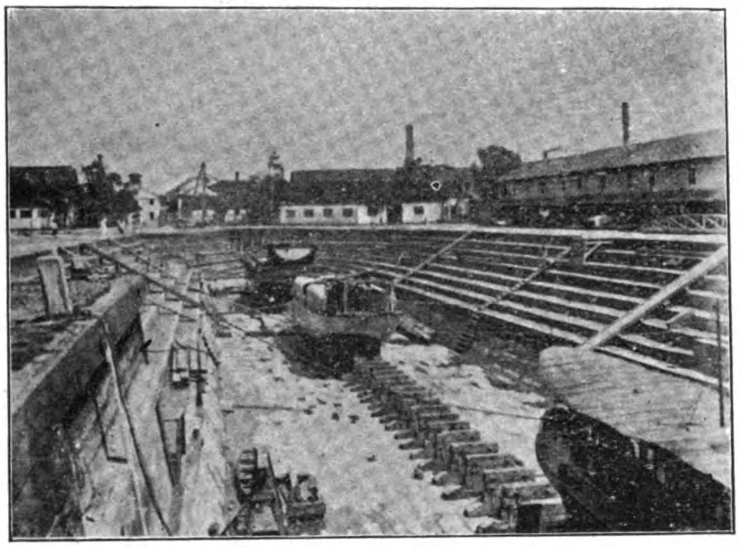

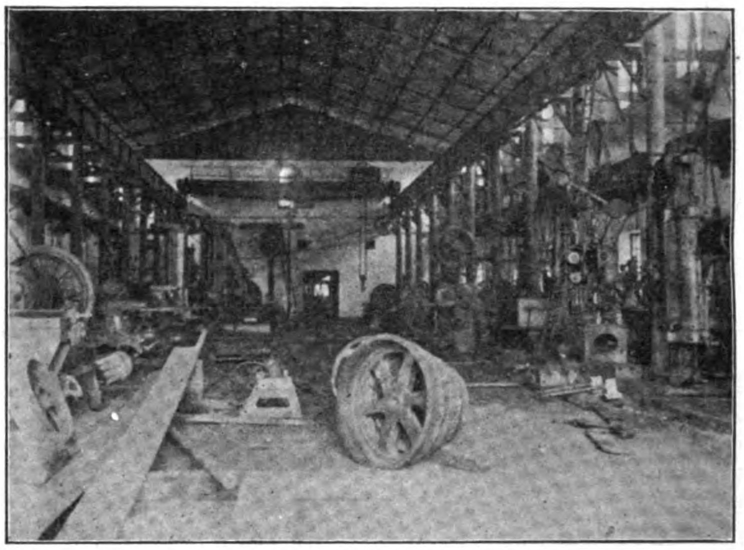

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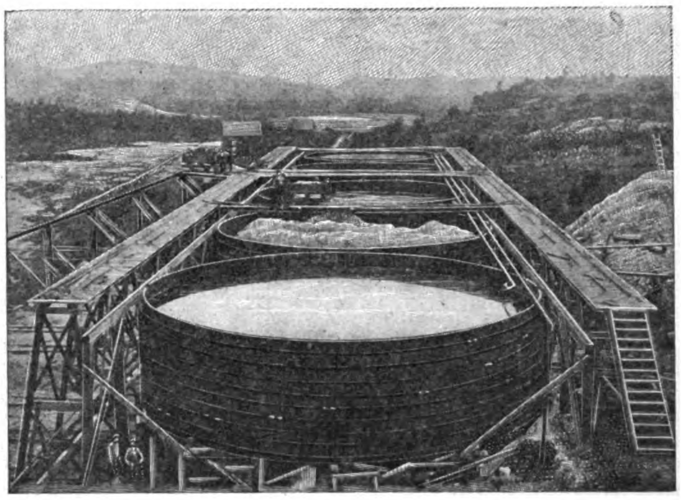

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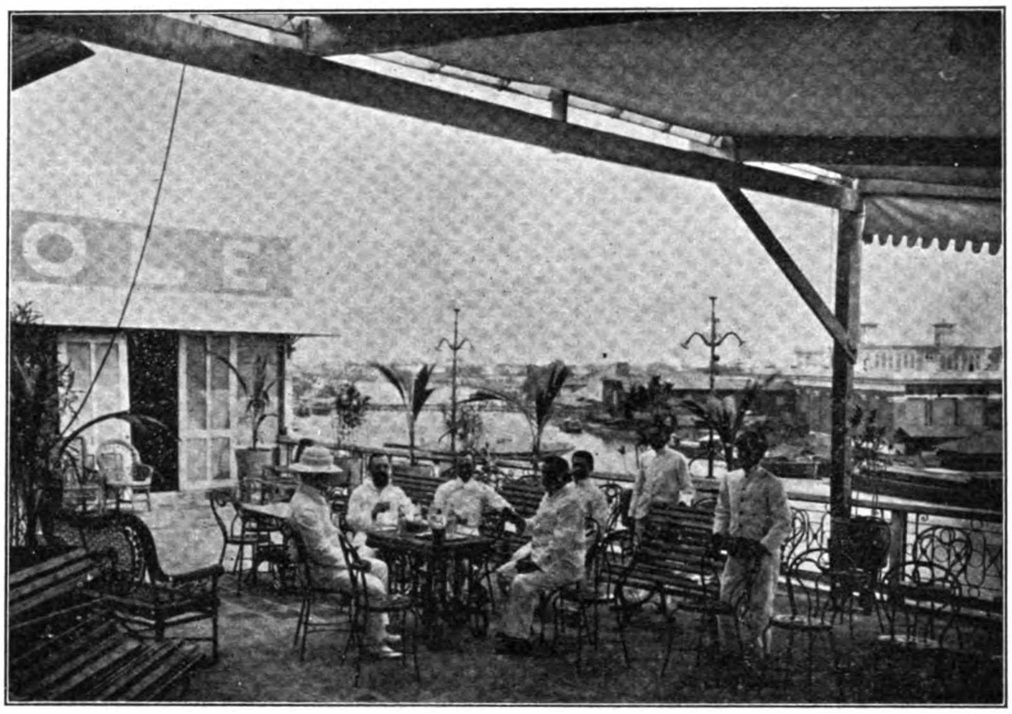

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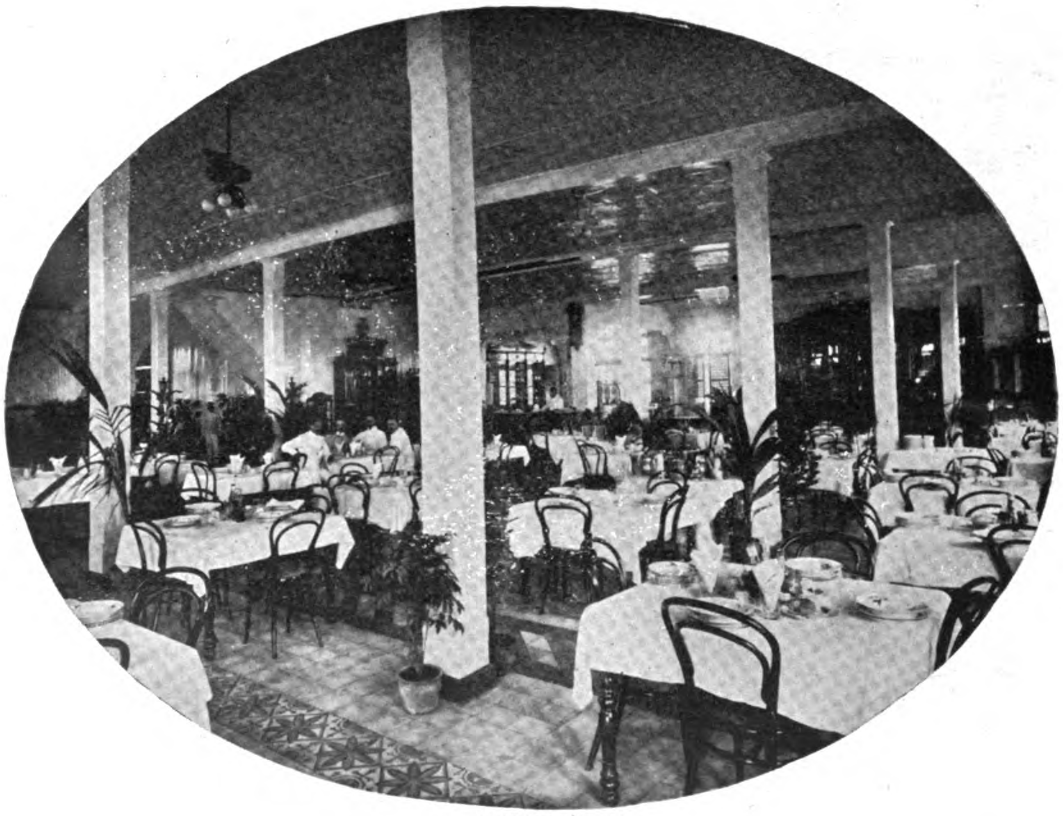

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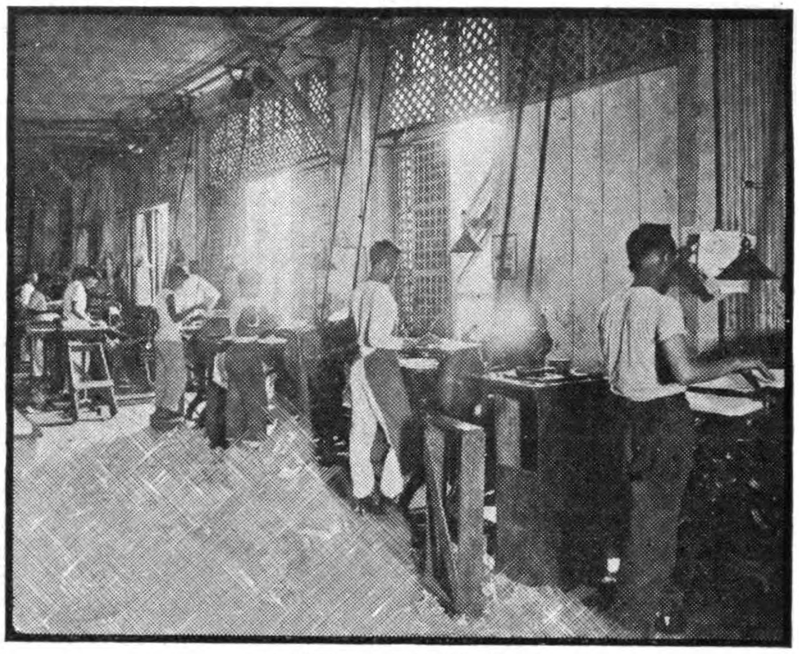

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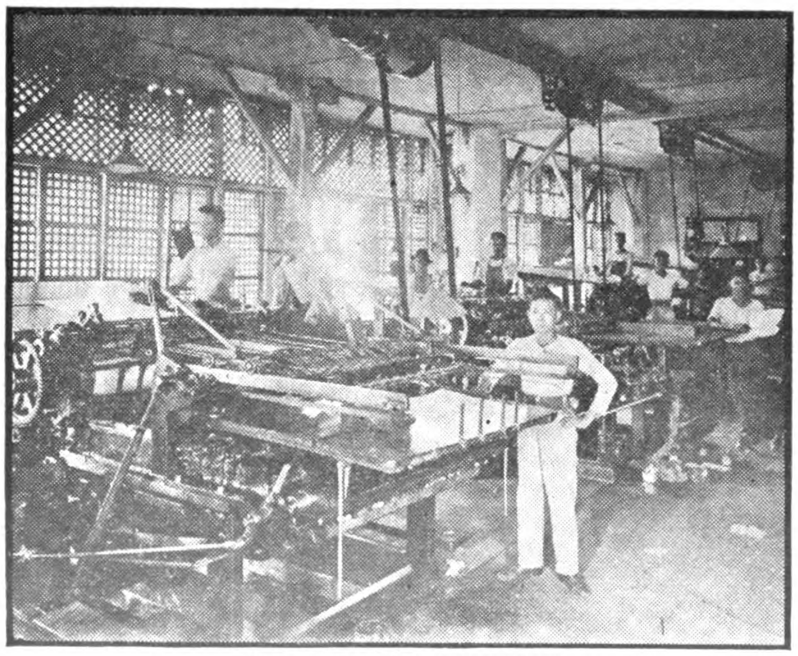

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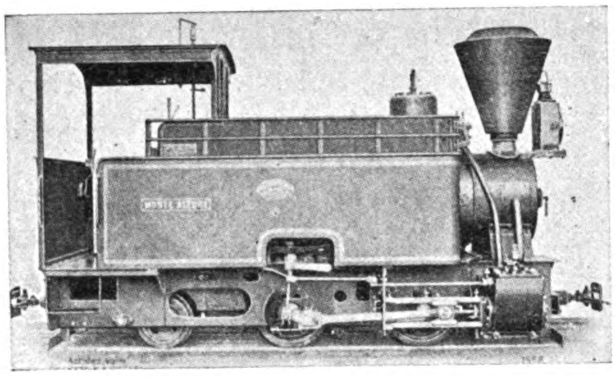

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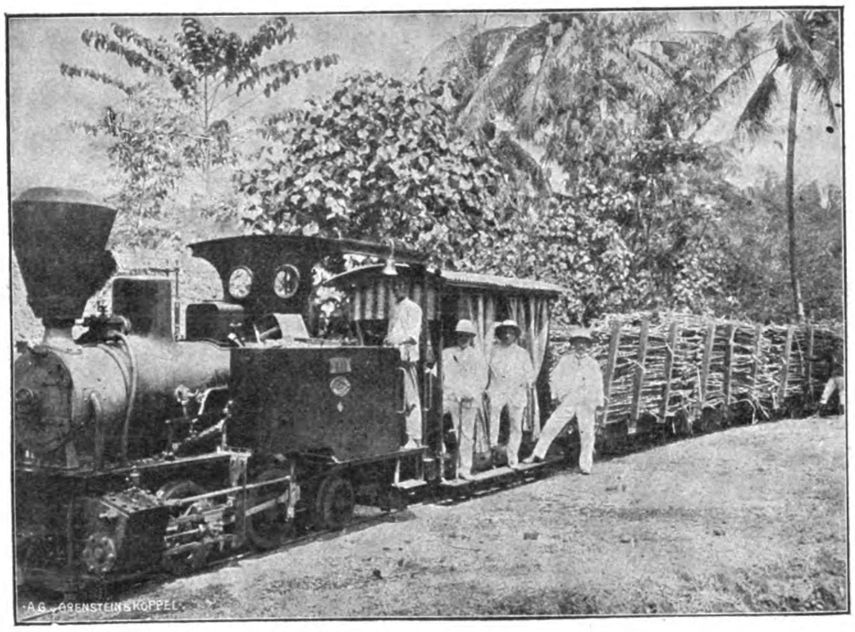

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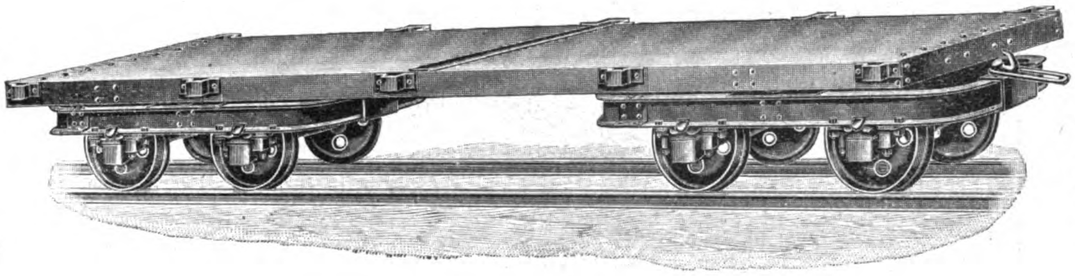

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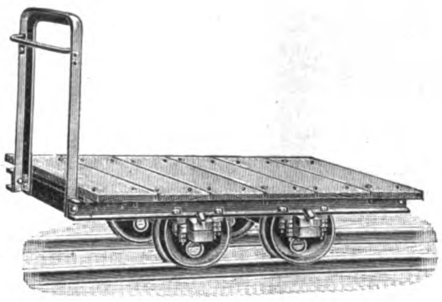

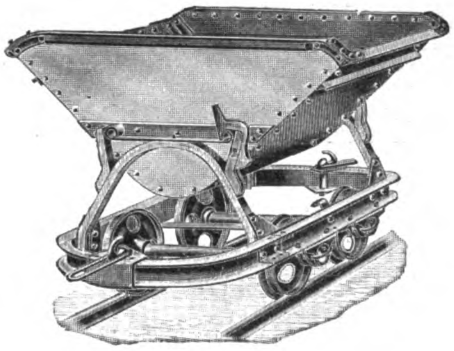

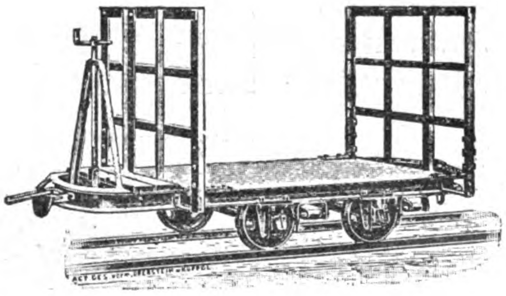

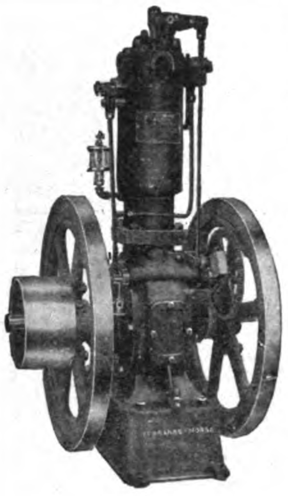

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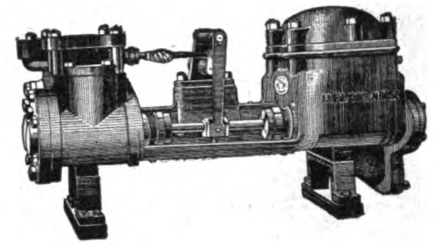

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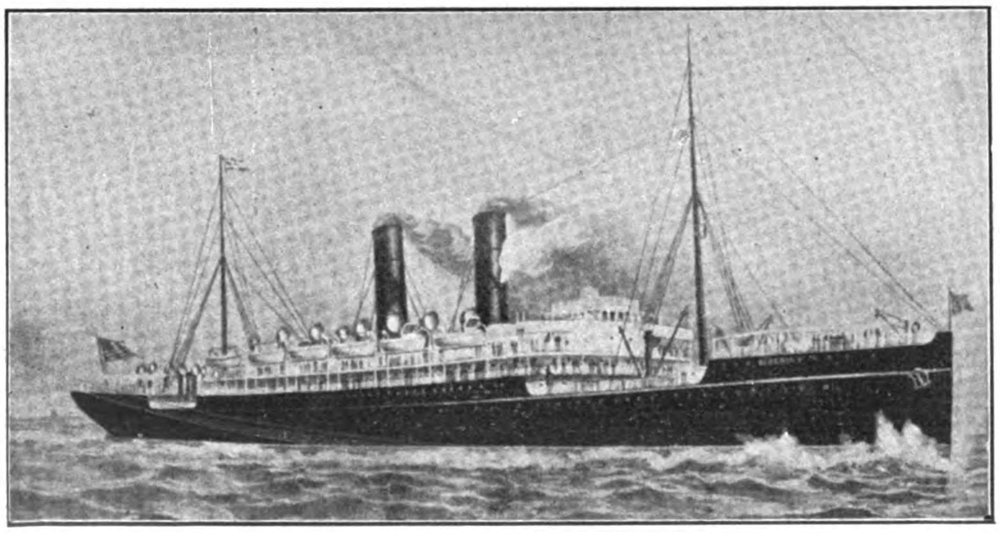

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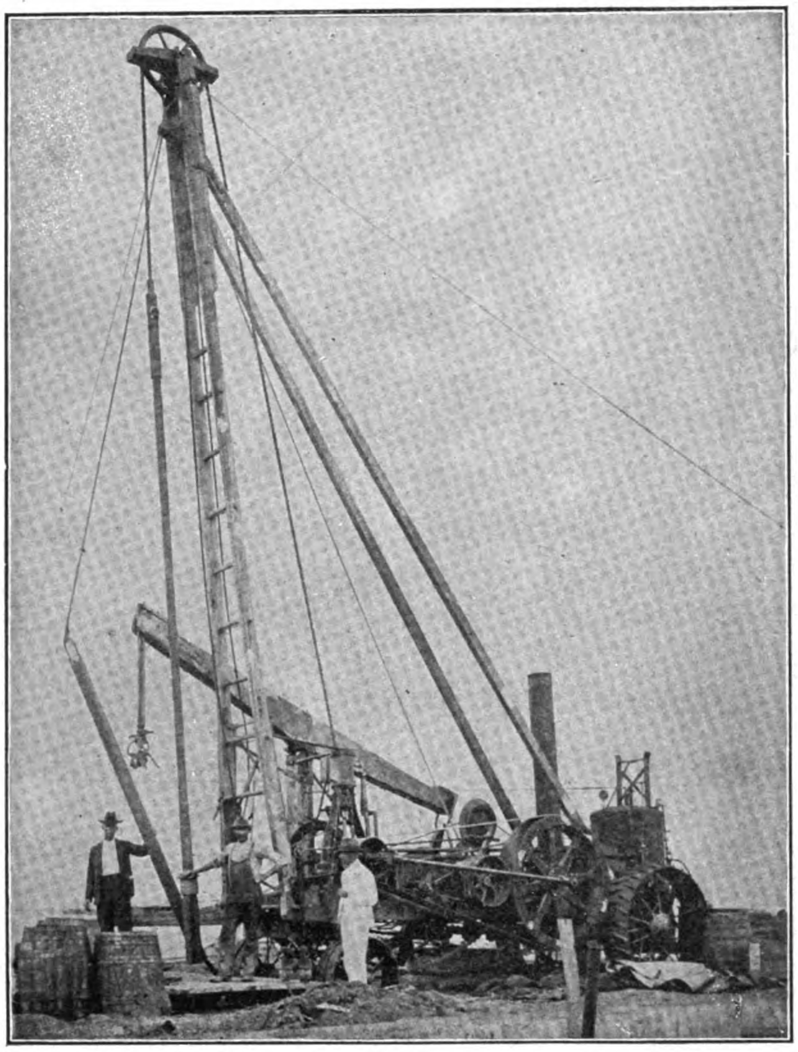

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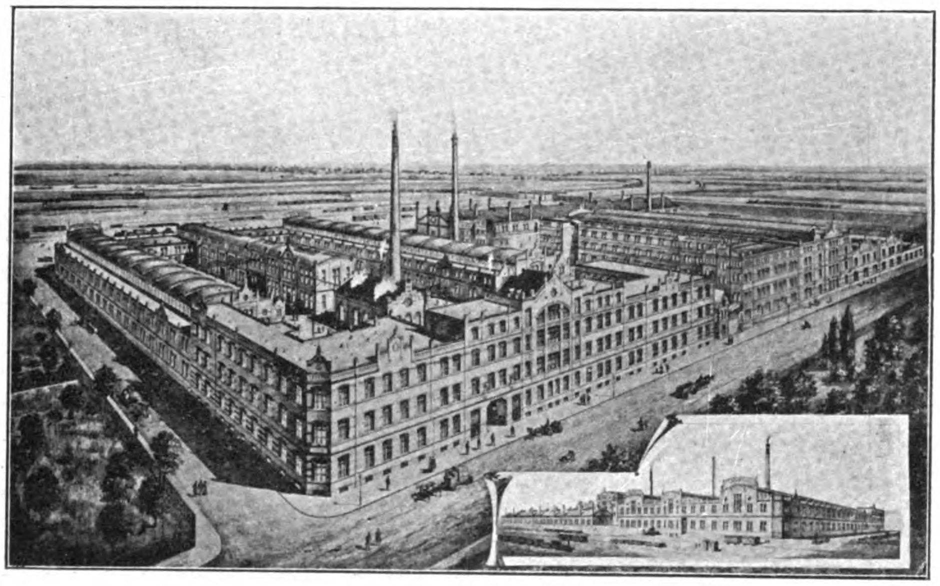

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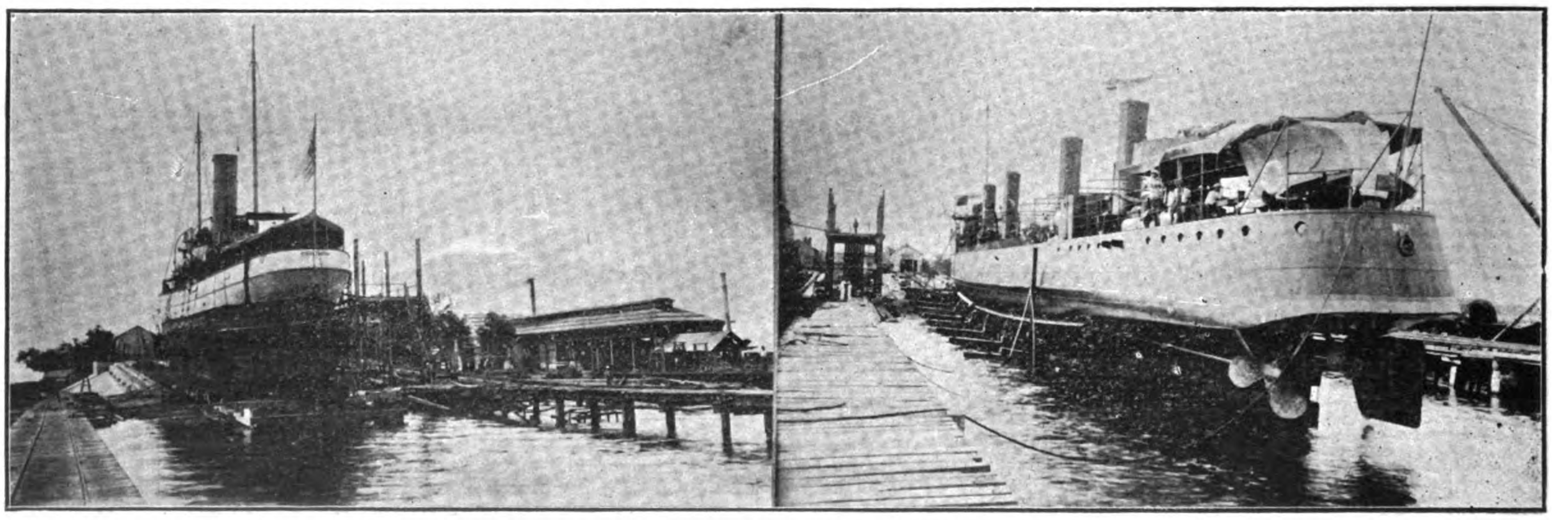

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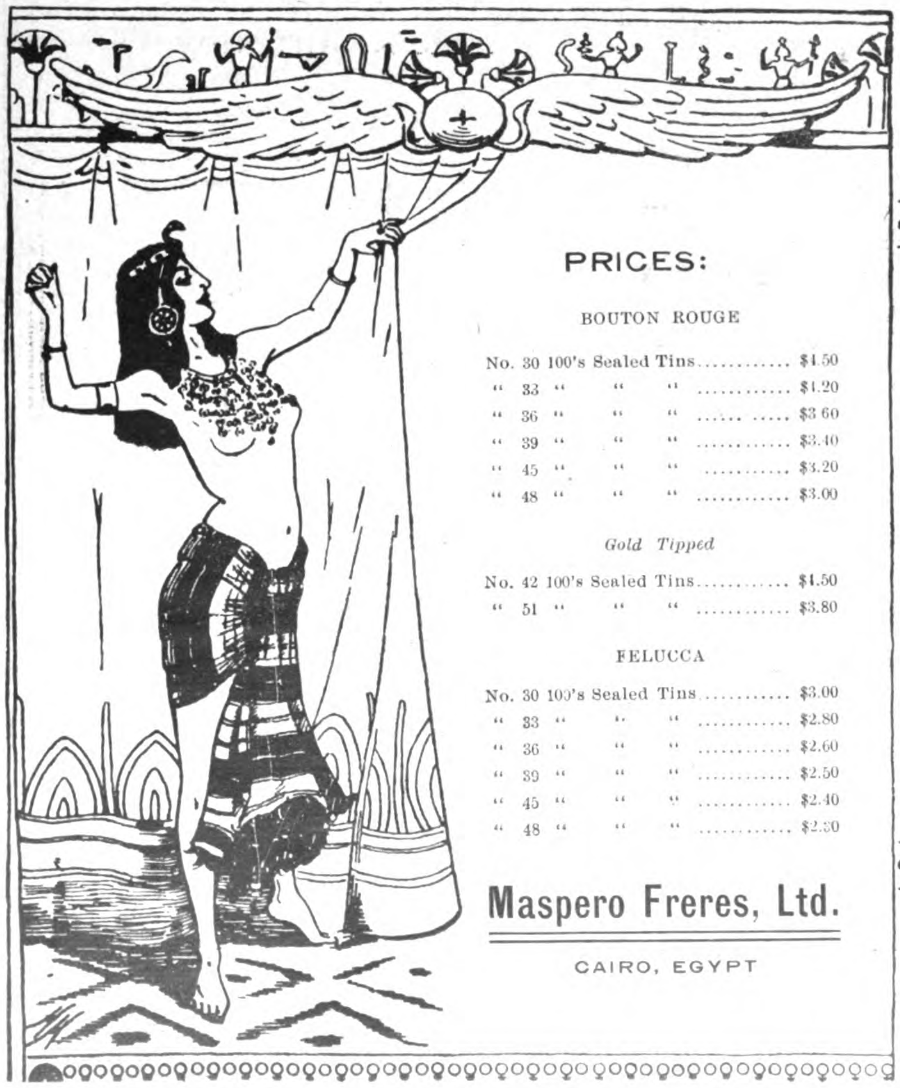

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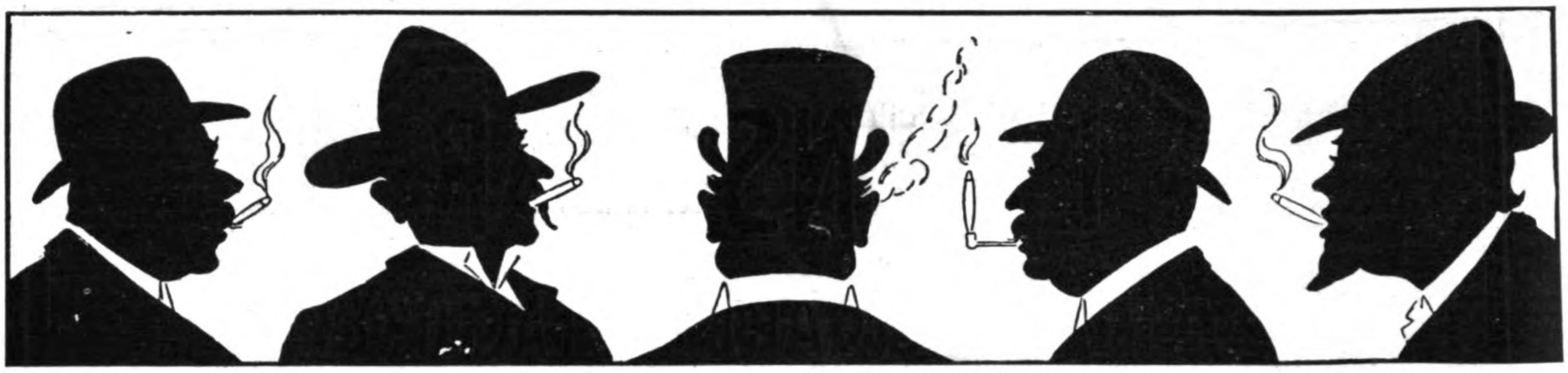

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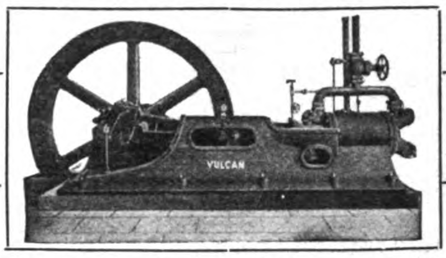
VUL  CAN

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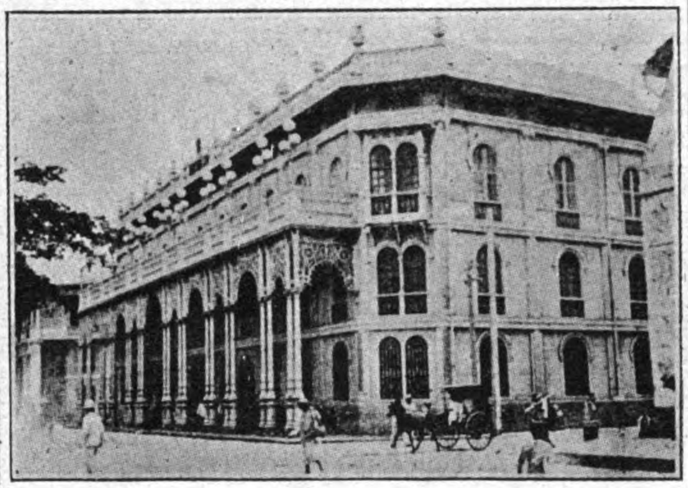

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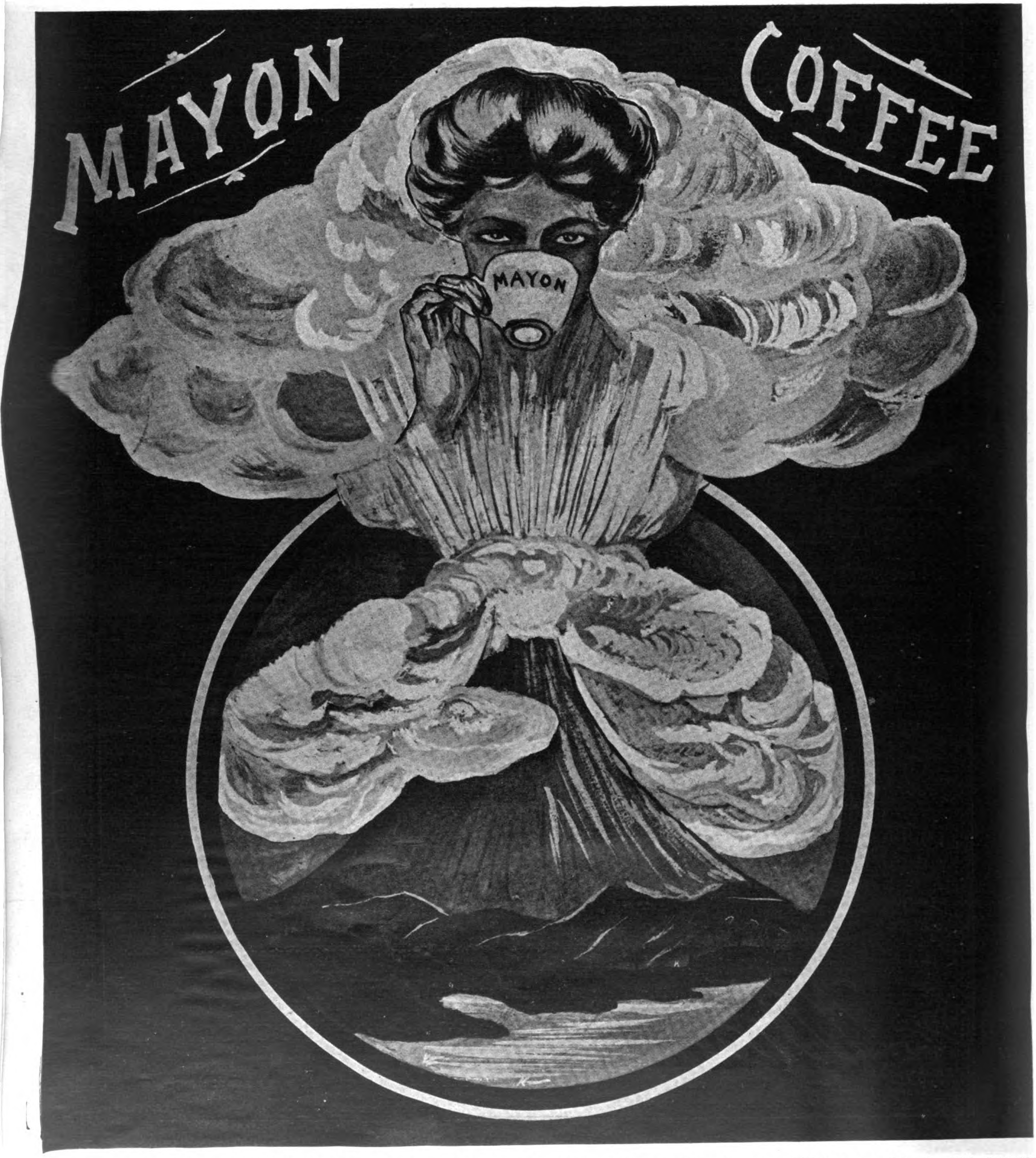

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OFFICIAL

PROPOSALS FOR LAUNCHES, LORCHAS, STEEL HULL AND BOILERS

HEADQUARTERS PHILIPPINES DIVISION, OFFICE OF CHIEF QUARTERMASTER.

Manila, P. I., May 8th 1907.

Sealed proposals in triplicate, subject to usual conditions, for the construction of five (5) Steel Steam Launches, eight (8) Steel Lorchas, One (1) Steel Hull and eight (8) Boilers, and delivery of same to the Quartermaster Department, U. S. Army, at Manila, P. I., will be received here until 10:00 a. m. June 15th 1907 and then opened. Blank form and necessary information furnished upon application to representative of the Consular Service of the United States at Hongkong, Shanghai, Singapore, and Chief Quartermaster, Philippines Division, Manila, P. I. Envelopes containing proposals should be endorsed "Proposals for Vessels and Boilers," to be opened at 10:00 a m, June 15th 1907, and addressed to the Chief Quartermaster, Philippines Division, Manila, P. I.

PROPOSALS FOR PLUMBING

HEADMASTER PHILIPPINES DIVISION, OFFICE OF CHIEF QUARTERMASTER

Manila, P. I., April 14th, 1907.

Sealed proposals in triplicate, subject to the usual conditions, for furnishing all labor and all material to install plumbing in buildings at Parang, Mindanao, and buildings at Jolo, Jolo, will be received here until 10:00 a. m. May 31st, 1907, and then opened. Plans, specifications, blank forms and information furnished upon application. Envelopes containing proposals for Plumbing, at Parang, Mindanao and Jolo, Jolo, to be opened at 10:00 a. m. May 31st 1907, and addressed to the Chief Quartermaster, Philippines Division, Manila, P. I.

PROPOSALS FOR STEEL TRUSSES

HEADQUARTERS PHILIPPINES DIVISION, OFFICE OF CHIEF QUARTERMASTER

Manila, P. I., May 4th, 1907.

Sealed proposals, in triplicate, subject to usual conditions will be received here until 10:00 a. m., June 4th 1907, and then opened for the furnishing and delivery at Manila, P. I., of fifty two (52) Steel Trusses. Blank forms and necessary information furnished on application. Envelopes containing proposals should be endorsed "Proposals for Steel Trusses" to be opened at 10:00 a. m., June 4th, 1907, and addressed to the Chief Quartermaster, Philippines Division, Manila, P I.

PROPOSALS FOR COAL

HEADQUARTERS PHILIPPINES DIVISION, OFFICE CHIEF QUARTERMASTER

Manila, May 11th, 1907.

Sealed proposals in triplicate, subject to usual conditions, for furnishing 60,000 tons of Coal to this Department during the Fiscal Year 1908 will be received at this office until 11 a. m. May 31st, 1907, and then opened. Information and blank forms furnished on application. Envelopes containing proposals should be endorsed "Proposals for Coal" and addressed to the Chief Quartermaster, Philippines Division, Manila, P. I.

OFFICE OF THE BUREAU OF SUPPLY.

Manila, P. I., May 14th, 1907.

Sealed proposals in triplicate will be received at this office up to 11 a.m. May 31st, 1907, when they will be opened in the presence of the attending bidders, for supplying various amounts of Butts, Crowbars, Linseed Oil, Putz Pomade, Rakes, Shovels, Soap, Steel, Tar, Washers, Ink, Paper, Penholders, Prison Cloth, and Cedar Poles.

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TO CONTRACTORS

OFFICE OF THE BUREAU OF PUBLIC WORKS, SANTA POTENCIANA BUILDING.

Manila, P. I., May 13, 1907.

Sealed proposals addressed to the undersigned and marked "Proposal for C. A. Set 148, Provincial High School, and C. A. Set 153, Provincial Building" will be received at this office until 11:00 A. M., June 8, 1907, for furnishing all material and doing all labor required to fully complete the erection of a Provincial High School and a Provincial Building at San Fernando, Pampanga Province, P. I., in the manner and on the conditions set forth in the form of proposal and the plans and specifications, copies of which with other information may be obtained upon application at the office of the Director of Public Works, Manila, P. I., or the District Engineer, San Fernando, Pampanga, P. I.

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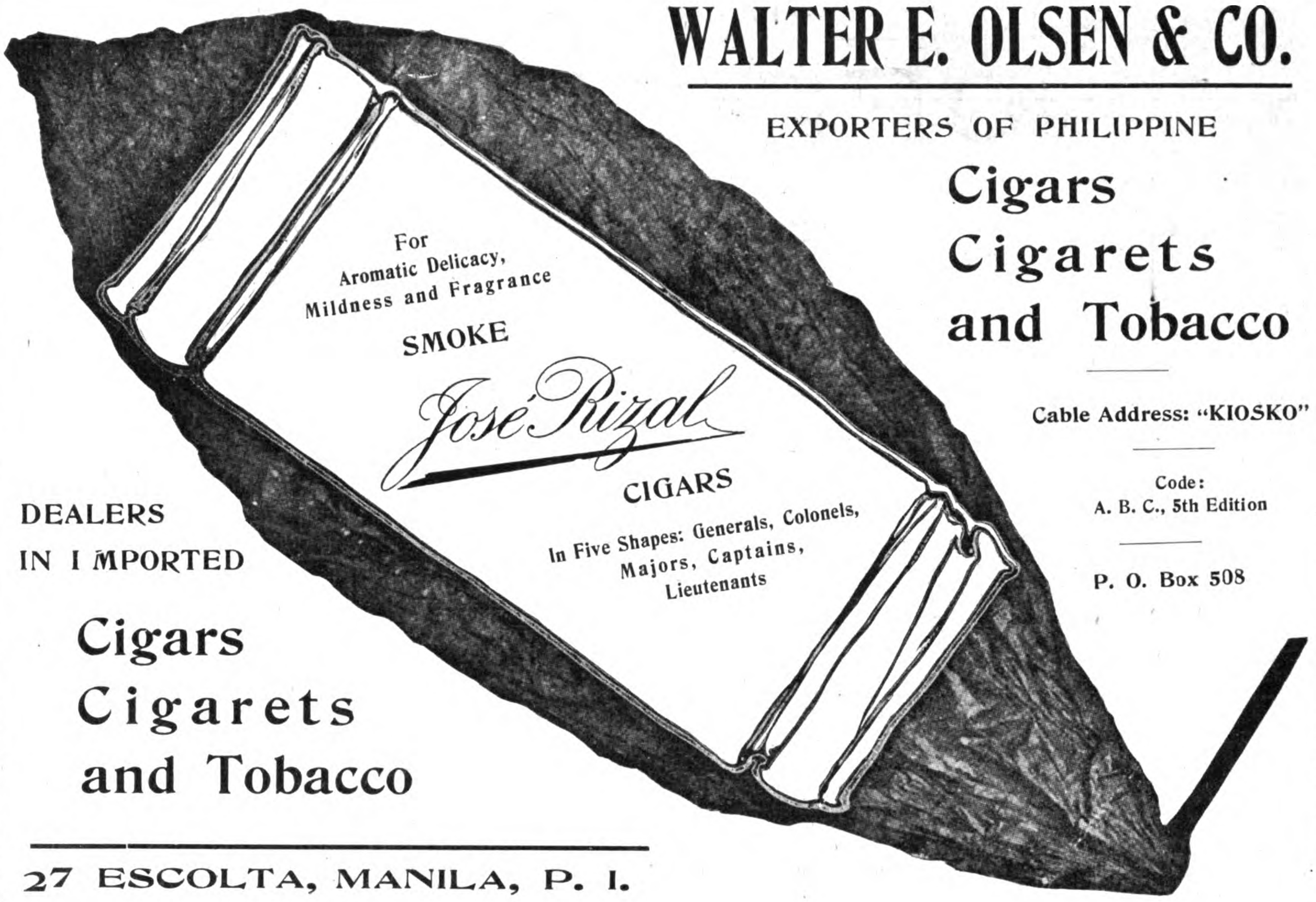

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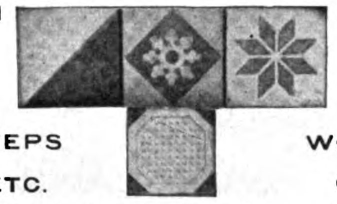

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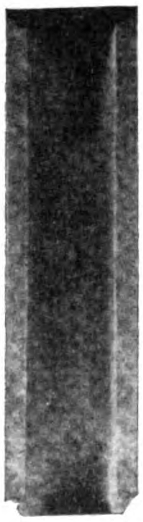

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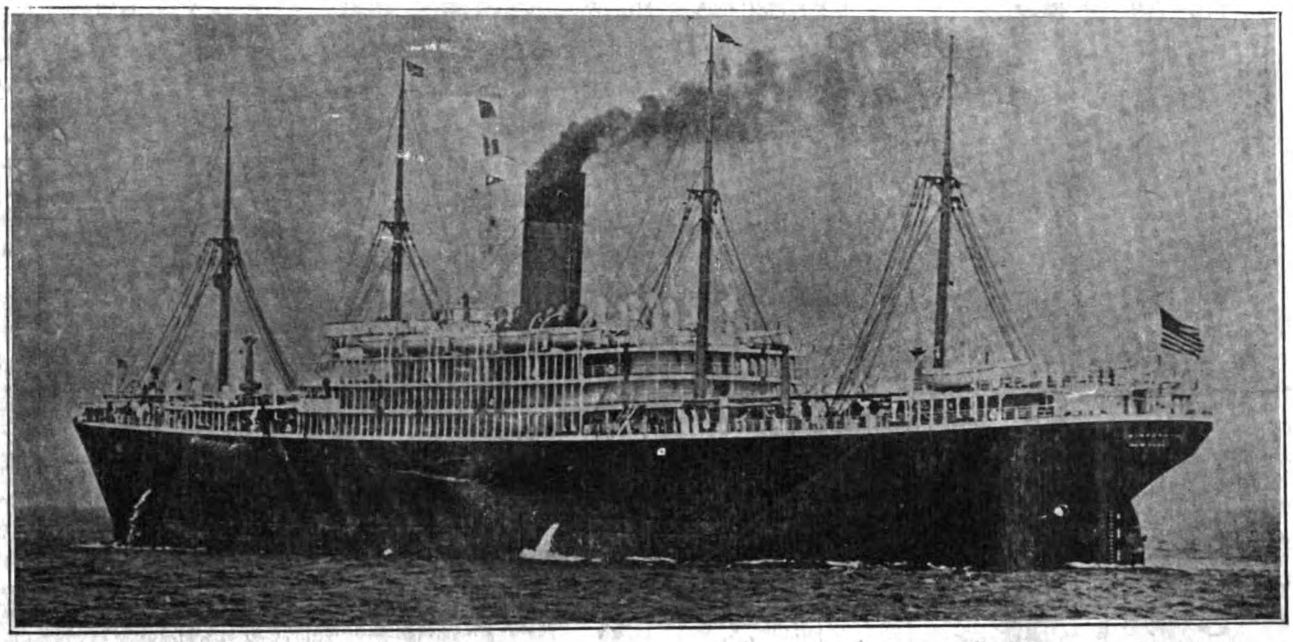

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